IMPLEMENTATION OF ANTENATAL CARE: GLOBAL HISTORY, CURRENT CHALLENGES AND QUALITY OF CARE PROVISION IN HAITI

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IMPLEMENTATION OF ANTENATAL CARE: GLOBAL HISTORY, CURRENT CHALLENGES AND QUALITY OF CARE PROVISION IN HAITI

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Antenatal care (ANC) is an essential health service for pregnant women. The individual interventions that comprise ANC have been shown to be efficacious and are recommended by the World Health Organization. However, there is poor evidence and guidance for optimal packaging of individual interventions and delivery mechanism(s). This lack of guidance contributes to inconsistent and poorly delivered care, resulting in limited improvements in maternal, fetal and newborn outcomes despite increases in ANC coverage globally.

This dissertation comprises three studies which analyze the problems, bottlenecks and potential achievements of ANC policy and implementation at international, national and local levels. The first is a review of the history of ANC policy and politics, in which we identified reasons for ANC's neglect and poor implementation internationally and nationally. The second and third studies examine ANC in rural Haiti. In the second study, we compare the quality of ANC in traditional, fixed clinics to an alternative delivery model, mobile clinics, and assess knowledge and care quality perceptions of care recipients. In the third study, we explore ANC providers' beliefs about ANC based on semi-structured interviews.

Our findings show that ANC failed to gain international support due in part to lack of leadership and powerful incentives favoring funding of vertical programs over more complex health services like ANC. In Haiti, we documented similar moderate- to poor-quality of care in both clinic models. The quality of education and counseling was particularly low, but interpersonal relations between providers and women were highly rated. Interviews with care providers revealed conflicts between their beliefs about

ANC and the potential to act on these due to environmental barriers. This likely leads to inconsistent and incomplete care.

The results of these studies suggest multiple steps to improve ANC. These include forging better leadership for ANC at the international level and performing research to develop comprehensive guidance for ANC packaging and delivery mechanisms. Care providers could benefit from tools to improve decision making that better reflect clinical guidelines, stronger supervision and support, and quality assurance mechanisms. These basic steps have the potential to improve the lives of millions of women and infants.

BIOGRAPHICAL SKETCH

Erica received a B.A. in Political Science from Penn State University in 1997. After a year working various jobs, she was accepted into the United States Peace Corps and agreed to go to Niger, West Africa. She worked as a Community Health Extension Agent in a small, rural village in western Niger and as the Regional Director of Helen Keller International's Trachoma Program. One of the many "side lessons" Erica learned while in Niger was about the local food system, including multiple aspects of planting, harvest, storage, processing and preparation. After returning to the United States, Erica wanted to continue learning about food systems in her own country and worked on and managed organic vegetable farms in New Jersey for almost five years, while continuing to work on public health programs in West and Southern Africa during the winters.

In 2005, Erica came to Cornell for a Master of Professional Studies in International Agriculture and Rural Development so that she could combine her interests of public health, development and food systems. While at Cornell she discovered the field of public health nutrition and the multi-disciplinary perspective of the Program of International Nutrition (PIN). She immediately knew this program was unique and fit her professional goals. In between completing her masters and starting the Ph.D. program in 2010, Erica performed a two year fellowship with the Congressional Hunger Center and Partners In Health, where she worked as the Nutrition Program Advisor in central Haiti.

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One of the things I will miss the most about being a Cornell graduate student is the wonderful friends, both old and the new. My time at Cornell was made all the better by spending time with “old friends”: Lesli, Andy, Rebecca, and Anna, who I have known since I was a masters student. And my “new friends”, who I was lucky enough to find myself with as a DNS student: Christine, Jessica, Elizabeth, Djeinam, Amanda, Francis and Emily. There are so many wonderful alumni of this program. I am honored to among such an elite group.

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Chapter 1 – Introduction

Preventable, adverse maternal and perinatal health and nutrition outcomes persist at high rates in many low-income countries (1, 2). The health and nutrition care that a woman receives along the continuum of care—prior to, during and after pregnancy and during delivery—can reduce these adverse outcomes (3). Care during each of these periods specifically targets certain outcomes. For example, preconception care includes provision of folic acid to prevent neural tube defects, care during pregnancy consists of interventions, such as neonatal tetanus protection to reduce neonatal mortality, and prevention of mother-to-child transmission (PMTCT) of HIV and postnatal care should promote early initiation of breastfeeding to reduce morbidity and mortality (4). Of these critical time periods, care during pregnancy, or antenatal care (ANC), may be the most complex and comprehensive to deliver because it consists of multiple interventions, has clinical, educational and behavioral objectives and outcomes and is time-sensitive and time-bound. ANC interventions aim to promote health and prevent disease, detect, treat and manage existing diseases and complications, and prepare women for birth and potential complications (5).

Current ANC guidelines are inconsistent and potentially confusing to policy makers and practitioners. The World Health Organization (WHO) recommends a reduced-visit model of care, often referred to as "focused antenatal care" (FANC). This model promotes four specifically timed visits with an emphasis on individualized care dependent on a woman's health and her situation (6). In addition to FANC, WHO publishes individual nutrition and reproductive health recommendations for pregnant women (7, 8).

Additional ANC policy and content guidance comes from a number of published guides, reviews and reports (Appendix 1.1). These guidance documents support a focused or reduced visit model, but out of 10 identified documents, no two contain the same recommended interventions or services. This is likely

the result of each document having a different intended audience (policy makers vs. practitioners), level of implementation guidance, valued outcome (maternal survival, maternal well-being, neonatal survival, neonatal morbidity, etc.) and level of evidence required for inclusion (experimental vs observational designs).

Additional confusion surrounding ANC could be due to piecemeal rather than systematic research in this area. Most previous research has focused on three main areas: health-seeking behavior (when, how often and from whom women seek care), women's views and perceptions of ANC, and the efficacy of individual ANC interventions. This leaves a number of important knowledge gaps at the level of ANC delivery, most notably the efficacy of ANC packages of care and implementation guidance for these packages in varying contexts. These knowledge gaps might explain two paradoxes of ANC: 1) why ANC implemented under routine conditions in developing countries has often failed to replicate positive results from efficacy studies and 2) why the prevalence of many of the adverse outcomes that ANC interventions could reduce remains high despite their demonstrated efficacy and a global increase in the proportion of pregnant women who seek ANC over the past 30 years.

Antenatal care's importance to nutrition interventions

There are numerous nutrition interventions that benefit pregnant women and their babies, including iron-folic acid (IFA) supplementation, multiple micronutrient and calcium supplementation, maternal balanced energy protein supplementation, maternal deworming, counseling about exclusive breastfeeding and iodization of salt (Table 1.1). In addition to these nutrition interventions, there are also a number of efficacious interventions that are "nutrition-related," or affecting a nutrition outcome, including PMTCT that can affect infant and young child feeding, reduction of indoor air pollution and malarial interventions that can reduce the incidence of low birth weight.

Table 1.1 - Efficacious nutrition and nutrition-related interventions during pregnancy

Nutrition or nutrition-related intervention	Outcomes affected
IFA supplementation	Reduce maternal anemia at term, reduce low birth weight (LBW), reduce very early pre-term birth
MMN Supplementation	Reduce anemia, LBW and intra-uterine growth restriction
Calcium supplementation	Prevent pre-eclampsia, reduce preterm birth, increase birth weight
Maternal balanced energy protein supplementation	Reduce small-for-gestational age (SGA), reduced stillbirths, increase birth weight
Maternal deworming	Reduce maternal anemia at term
Counseling for exclusive breastfeeding	Reduce neonatal morbidity and mortality
Maternal iodine supplementation/salt fortification	Reduce infant mortality and risk of hypothyroidism
Prevention of mother-to-child transmission of HIV	Infant and young child feeding
Reduction of tobacco consumption/indoor air pollution	Reduce stillbirth, premature delivery and LBW
Intermittent preventive treatment for malaria	Increase mean birth weight for first or second pregnancies, reduction in LBW
Use of insecticide-treated bed nets	Reduce LBW

Sources: Campbell et al., 2006; The Partnership for Maternal, Newborn & Child Health. 2011; Black et al. 2013

ANC and nutrition interventions during pregnancy are intertwined. The majority of women only access nutrition interventions if they present for antenatal care at a health clinic. Nutrition interventions comprise a large portion of the content of ANC and ANC is the delivery mechanism for nutrition interventions to reach women. Poorly-implemented ANC can affect the success of nutrition interventions in multiple ways. An ANC system with unreliable supply chains or staffing can't distribute supplies in a timely way. Inadequate numbers and poorly trained staff can't provide high-quality care. If women do not perceive ANC as beneficial because of poor-quality or unsatisfactory care, they delay, reduce use of or do not attend ANC(9). Thus, the status of ANC directly affects delivery of nutrition interventions and is of concern to nutritionists interested in reducing adverse outcomes.

Organization of dissertation

The overall goal of this research was to identify factors that prevent ANC from being more successful at the international, national and local levels and to make recommendations to improve ANC implementation. This dissertation explores three key topics: why ANC has failed to gain political priority at international and national levels, the quality of ANC implementation in two delivery models of care and determinants of provider behavior for ANC (Figure 1.1).

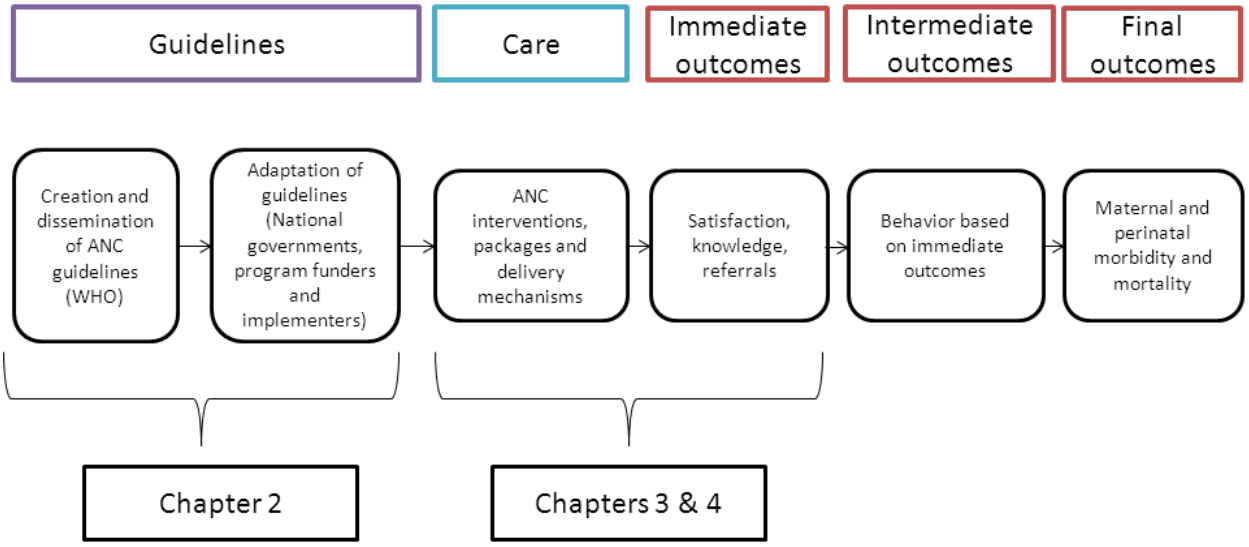

Figure 1.1 – Conceptual model of antenatal care from creation and dissemination of guidelines to final outcomes

Chapter 2 contains a review of the history of ANC policy and implementation and includes a policy analysis framework to analyze why ANC has not been a political priority for policy makers at international and national levels. Based on identified barriers to ANC, we propose multiple actions that could be taken in the short- and long-term to improve ANC policy and guidance. This component of the dissertation is unique, as it is the only historical review and policy analysis of ANC in the literature. Our

proposed actions can be used by advocates of maternal and child health and nutrition to gain attention for ANC, which may lead to improved outcomes.

The focus of Chapter 3 is quality of care provision and the immediate outcomes of ANC in Haiti. ANC quality and outcomes are compared between two delivery models, traditional fixed (non-mobile) clinics and mobile clinics. The comparisons are made on the basis of 999 observations of ANC consultations and a survey with 585 women about their ANC experiences. This paper contributes to the literature on quality of ANC by assessing an alternative model of care, mobile clinics, which are often promoted as a viable means to reach geographically isolated populations but whose quality have not previously been evaluated.

In Chapter 4, we explore determinants of ANC provider behavior by performing semi-structured interviews with 18 ANC providers who were observed. Interviews explored individual-level determinants of provider behavior. Specifically, we identified provider beliefs about what ANC can accomplish and their views of high- and low-quality ANC and how these beliefs interact with their environments to affect decision making and ultimately, behavior. Provider behavior is not well understood for ANC and this paper, to our knowledge, is the first to explore these determinants.

Using this organization, this dissertation examined a wide range of factors and dynamics at global, national and frontline levels that compromise the translation of evidence-based, efficacious health and nutrition interventions into effective programs delivered at scale. This effort to integrate knowledge across multiple scales is consistent with the understanding that large-scale improvements in health require a systems perspective (10) and that specialized research on individual components of these systems is not a sufficient basis for achieving health goals (11).

Implementation Science

As mentioned above, there are numerous efficacious interventions that comprise ANC, yet real-world practice and outcomes often do not reflect the findings from efficacy studies. This "efficacy-effectiveness gap" can be closed with the application of implementation science (12). At its most broad, implementation science can be defined as "scientific inquiry into questions concerning implementation – the act of carrying an intention into effect, which in health research can be policies, programmes, or individual practices."(13)

The studies in this dissertation include some of the essential principles of implementation science as outlined by Peters et al. (13). The research questions in the two Haiti studies examine if the implementation quality of an alternative ANC delivery model is comparable to the traditional delivery method (Chapter 3) and explores the determinants of implementation quality (Chapter 4). This research applied a mixed-method approach, allowing triangulation of data between methods to assess consistency of findings. Outcome measures include fidelity of ANC according to Haitian guidelines and determinants of fidelity. Finally, these studies were planned in collaboration with programmatic decision makers at World Vision and the results from these studies can be used by World Vision and other ANC implementers (NGOs and the Ministry of Public Health and Population (MSPP)) who participated in the study to base policy and programming decisions and identify quality improvement strategies.

Context

The field work of this research was performed in the Central Plateau of Haiti, one of the poorest departments (equivalent to a state) in Haiti. Indicators of maternal and child health and nutrition in the Central Plateau are poor. Forty-seven percent of women are anemic, 28% of children under 5 are stunted and 5.2% are wasted (14). This compares to 49.3%, 21.9% and 5.1%, respectively, for the entire

country. ANC coverage has improved steadily over the past five years (14, 15). Over 90% of Haitian women seek at least one ANC visit, with 67% seeking the recommended four ANC visits. This is an increase of 5.5% of women who seek any ANC and 13.5% of women who seek at least four visits since 2006-2007. Women with higher education, women in their first three pregnancies and wealthier women (according to quintile) were most likely to seek care.

There are two predominant models of ANC delivery in the Central Plateau. The first model, the most common way of providing ANC, is based in fixed health centers, such as dispensaries, health centers or hospitals. These are found in larger towns and cities and the majority are operated by the Ministry of Public Health and Population (MSPP) or in partnership with the MSPP. The second delivery model is mobile clinics, in which a health care provider travels to less populated or geographically-isolated communities and offers ANC on monthly basis at a predefined time and location. Roughly 130 mobile clinics were offered by World Vision each month at the time of the study.

To be as effective as possible in achieving positive maternal and neonatal health outcomes, mobile clinics must be coordinated with the health system, not independent of it (Figure 1.2). Mobile clinics can serve as a link between communities and the larger system of fixed health centers by 1) being the entry point into the health care system for many pregnant women and 2) screening and referring women who need higher level care to Level 1 or Level 2 facilities[1].

The current system of mobile clinics can serve as the primary ANC provider for women who are not at high risk and do not develop complications, as long as women seek laboratory testing at a higher-level facility, as mobile clinics do not offer laboratory testing on a regular basis. However, for some women,

[1] The three levels of health care centers in Haiti are defined as Level 1 (or primary) with tiers 1 and 2, Level 2 (or secondary) and Level 3 (tertiary). Level 1, tier 1 includes health centers with and without beds, dispensaries and private clinics and Level 1, tier 2 are community reference hospitals. The secondary level is the departmental hospital and the tertiary level includes both university hospitals and specialists.

the level of care offered at mobile clinics will not be sufficient and they will need to be referred to a higher level of care. For these women, the referral and counter-referral system between levels of care must be functional so that appropriate and non-duplicative care is provided. This would require effective communication and coordination between World Vision and management at fixed health care centers.

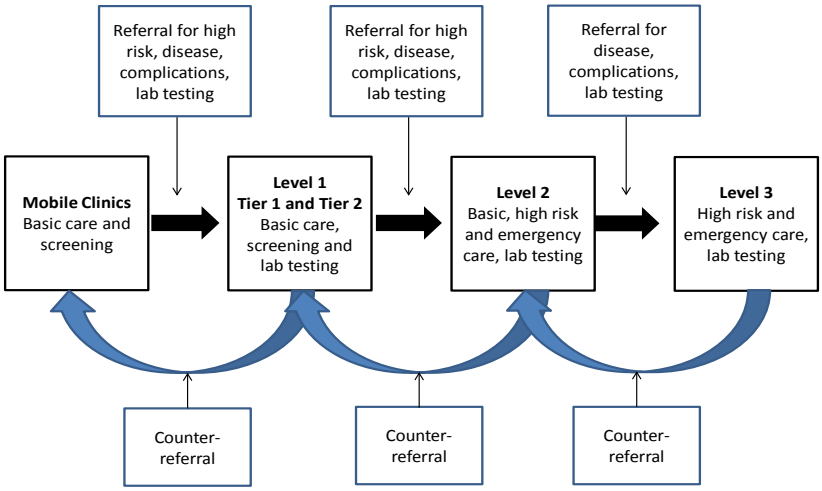

Figure 1.2 – Schema of Haitian antenatal care system
Compiled from: The Manual of Labor Standards in Maternal Care, 2010

As part of the National Strategy for Reproductive Health, the MSPP has published national ANC guidelines (16). These guidelines do not match WHO FANC guidelines in terms of the number of visits recommended, the content of these visits or the timing of services implemented. To the author's knowledge, there are no efforts to update the Haitian standards to better align them with international recommendations.

The Haitian context is unique in some ways, but also similar to other developing countries where the health infrastructure is weak, nongovernmental organizations implement health programs to

complement government programs and poor maternal outcomes persist. The results and recommendations from this dissertation are therefore relevant to other similar countries and contexts.

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APPENDIX

Appendix 1.1 – Identified Publications with ANC Guidance

Year	Title	Publishing Agency	Department/Series
2002	Antenatal Care Randomized Trial: Manual for the Implementation of the New Model	WHO, but says "not an official WHO document"	Dept of Reproductive Health and Research, Family and Community Health
2003	What Works: A Policy and Program Guide to the Evidence on Family Planning, Safe Motherhood, and STI/HIV/AIDS Interventions	POLICY Project (Funded by USAID)	Formerly The POLICY Project, now the Health Policy Initiative
2004	Basic Maternal and Newborn Care: A guide for Skilled Providers	USAID	JHEPIEGO/MHN
2005	Evidence-Based, Cost-Effective Interventions: How Many Newborn Babies Can We Save?	The Lancet	Neonatal Survival Series
2006	Pregnancy, Childbirth, Postpartum and Newborn Care: a guide for essential practice	WHO	Integrated Management of Pregnancy and Childbirth
2006	Strategies for Reducing Maternal Mortality: Getting on With What Works	The Lancet	Maternal Survival Series
2007	Standards for Maternal and Neonatal Care	WHO	Integrated Management of Pregnancy and Childbirth
2008	What works? Interventions for maternal and child undernutrition and survival	The Lancet	Series on Maternal and Child Undernutrition
2009	Recommended Interventions for Improving Maternal and Newborn Health	WHO	Integrated Management of Pregnancy and Childbirth
2009	Maternal and Newborn Care	USAID	Bureau for Global Health, Office of Health, Disease and Nutrition/ Child Survival and Health Grants Program (CSHGP); Technical Reference Materials
2010	Packages of Interventions for Family Planning, Safe Abortion Care, Maternal and Newborn and Child Health	WHO	Family and Community Health
2011	A Global Review of the Key Interventions Related to Reproductive, Maternal, Newborn and Child Health	The Partnership for Maternal, Newborn and Child Health	
2013	Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?	The Lancet	Series on Maternal and Child Nutrition

Chapter 2 - Antenatal Care: History, challenges and suggestions for the future[2]

Abstract

Antenatal care (ANC) is an essential health service for women in many low-income countries. The evidence base for individual ANC interventions is stronger today than ever before and coverage of ANC has increased globally over the past 30 years, yet ANC has not received the same interest and action as other global health initiatives. This paper applied policy analysis methods to explain why ANC has not been perceived as a priority health service at international or national levels. We identified important reasons for ANC's neglect, including a lack of a leadership by international-level institutions, national-level policy makers and civil society, ANC's poor fit within the main goals of MDGs 4 and 5, the complexity of ANC as health service (not a vertical intervention), socio-cultural issues that surround women's reproductive health and a lack of cohesive framing of ANC, in part due to lack of leadership.

Based on our analysis, we propose multiple actions that could be taken in the short- and long-term to improve ANC at international and national levels, including generating leadership for ANC by groups within the WHO, designing future health goals that prevent short-sighted incentives for health programs, researching and promoting ANC as an integrated health service and adding to the evidence base for ANC by calculating the disability-adjusted life years (DALYs)-averted. These steps do not require large financial investments or new technologies, but will require a long-term vision, political will and implementation research. These actions could contribute to substantial improvements in the health and

[2] This chapter was submitted to The Micronutrient Initiative as a draft report with the following authorship: Erica Phillips, Kate Dickin and Rebecca Stoltzfus

well-being of countless women and children, if combined with parallel efforts to strengthen national ANC policies and delivery systems.

Section 1 - Introduction

Antenatal care (ANC) is a health service delivered to pregnant women that contributes to numerous maternal, fetal and neonatal outcomes. ANC can reduce neonatal and maternal morbidity and neonatal mortality directly through prevention, management and treatment of disease and complications of pregnancy such as anemia, tetanus, malaria, HIV/AIDS and hypertensive disorders (1). Through indirect pathways ANC can reduce morbidity and mortality and contribute to health by increasing the number of women who give birth with a skilled attendant, educating women and communities about recognition of pregnancy, delivery and post-partum danger signs and promotion of exclusive breastfeeding (2). Given these benefits to both mothers and babies, it is surprising that ANC does not receive greater priority among health services.

In contrast to a "vertical" program[3], ANC is a complex health service consisting of multiple interventions (often combined into distinct "packages" of interventions), relies upon behaviors of health workers and recipients of care for success, has multiple outcomes and stakeholders, and often requires tailoring to meet unique national and individual client needs (3). Well-functioning ANC systems provide care that is broad enough to meet the needs of all women, yet adaptive enough to handle the infrequent, serious complications that can arise. This requires both supply and demand side characteristics for success. On the supply side, necessary national level policy and care delivery components include clear and up- to-date national ANC policies, effective dissemination of these policies and well-trained and supported

[3] Although often referred to as dichotomous in practice most health programs exist on a continuum and are neither strictly horizontal nor vertical (Oliveira-Cruz et al, 2003). Factors such as program financing, management, implementation, staffing and supply chains determine where a program falls on the horizontal-vertical continuum.

health staff and integration of care across levels. On the demand side, frequent, well-timed utilization and acceptable care to pregnant women are essential. ANC health seeking and delivery of care is even more complex than other health services due to socio-cultural factors that affect women's health and sexuality.

Unfortunately, these characteristics of successful ANC are not present in many low-income countries. ANC is often fragmented, dominated by highly-publicized vertical interventions and provides poor quality care. Care seeking behavior is highly variable between and within countries, many with non-ideal patterns of utilization and follow-up. Given these factors, ANC is not achieving its full potential.

The evidence base for ANC interventions is stronger today than ever before, showing clear benefits of ANC to women and babies. Yet ANC does not receive the same interest and action as other global health initiatives. This paper applies policy analysis methods to help explain why ANC has not been perceived as a priority health intervention at international or national levels. Based on this analysis, we propose multiple actions to move ANC forward as an essential health service, beyond disjointed combinations of single interventions, to studied packages of interventions that are integrated into health systems. If these actions are taken, we believe ANC can be improved, leading to substantial health benefits to women and children.

Section 2 - A Historical Look at ANC

The 80-year debate

In 1972, Archie Cochrane noted that ANC, "…by some curious chance, has escaped the critical assessment to which most screening procedures have been subjected in the last few years..." (4) Primarily based on the United Kingdom's ANC model from the early 1900s, ANC was imported by developing countries without determining whether these services could or were, in fact, meeting the

populations' needs. This lack of scientific assessment led ANC to be called "ritualistic" (5), with "unrealistic" expectations "of what might be achieved" (6); it is no wonder a debate about the content and the value of ANC has lingered over 80 years and continues to shape ANC today (6-11).

In the two decades following Dr. Cochrane's observation, two factors contributed to further obscure the potential value of ANC. First was that observational studies were (and to some extent continue to be) used to study links between ANC and outcomes where experiments were not possible. Although these studies tended to show a positive relationship (and dose-response relationship) between ANC and various outcomes, these studies have suffered from selective participation, wide variability in coverage, content and quality of ante-, intra- and post-partum care, limitations due to ethical challenges of antenatal research and other confounding factors related to care seeking behavior (12, 13). At times this has led to incorrect conclusions and lingering effects on ANC policy in many countries, such as promotion of frequent ANC visits based on the observed dose response relationship in early studies (14).

The second factor contributing to confusion about the value of ANC in the 1970s and 1980s, was that ANC recommendations included services in the ANC package that were not evidence-based and were later found not to confer any benefit to mother or baby. Examples include routine measuring of weight and risk assessment, both of which were cornerstones of ANC. Routine weight assessment, performed to screen for excess weight gain due to pre-eclampsia and poor weight gain leading to low birth weight (LBW), is now understood not to reliably detect these outcomes (11). Risk assessment was expected to identify women more likely to develop life-threatening complications and allow health workers to intervene as needed to prevent poor outcomes (15). The risk assessment approach was highly promoted by the Safe Motherhood Initiative (SMI) in the 1980s, but was later shown not to be effective in distinguishing women who would develop a life threatening complication from those who would not (11, 16, 17).

As a result of ANC models incorporating these non-evidence based interventions, the proponents of the Safe Motherhood Initiative incorrectly concluded that ANC as a whole could not contribute to reduction of maternal mortality and therefore was not a priority intervention for women's health. The more likely conclusion should have been that those specific interventions were mistakenly promoted in the absence of evidence for their efficacy. SMI's conclusions are thought to have harmed ANC's credibility in the scientific and policy communities and resulted in an unfortunate and unfounded disappointment with ANC (18). A positive outcome is that these missteps also called attention to the need for stronger evidence about ANC's content and effects, leading to the WHO ANC Trial.

The 1990s WHO Trial

The WHO Antenatal Care Trial, conducted between 1996 and 1998, is the most influential trial of ANC. It was a large-scale, cluster-randomized trial of a new ANC model conducted in four countries with relatively highly-functioning health systems: Argentina, Cuba, Saudi Arabia and Thailand (19). The trial tested the "standard" model of care, as implemented in each country, to a "new model" of care with three modifications: a) the content of ANC, including only interventions believed to be beneficial[4], b) frequency of visits (a "reduced" visit model of four ANC visits instead of the average eight across countries) and c) the timing of visits, specifically in the first trimester, and at 26, 32 and 38 weeks of gestation. Although the study's non-inferiority trial design did not allow conclusions to be made about the model's individual components (the content, number or timing of visits), nor the overall benefit of any ANC compared to no ANC, there were no significant differences in the primary maternal and

[4] Due to a lack of rigorous evidence for many interventions, the final ANC model used in this study was selected based on two large reviews of evidence of the effect of ANC to eliminate or alleviate select adverse outcomes for women and newborns (Villar and Bergsjo, 1997 and Bergsjo and Villar, 1997).

neonatal outcomes[5] between the new and standard models. This reduced-visit model is now promoted by the WHO and often referred to as focused antenatal care (FANC).

The WHO study advanced the knowledge of ANC by rigorously testing an updated model of care composed of a package of services thought to have sufficient evidence for inclusion (17, 20). This was previously not done on a large scale or in middle-income countries. The study was lauded as potentially contributing to better distribution of health resources in developing countries, but the cost implications of the new model remain unclear (19). Two of the countries in the trial (Cuba and Thailand) had sufficient cost information available for analysis and found a trend towards reduced cost to providers, women's out-of-pocket expenses and time to access care in the new model compared to the standard model (19). Both women and providers were reasonably satisfied with the new model compared to the standard one. About 75% of women in the new model believed that the number of visits was "right" and were happy with the spacing between visits, compared to 87 and 84% of women in the traditional model.

ANC in the 2000s

In the decade since the publication of this trial there have been two important developments. First, a 2010 Cochrane review of "alternative"[6] versus standard packages of antenatal care for low-risk pregnancy found that in the three studies conducted in low- and middle-income countries (the WHO ANC Trial and two studies in Zimbabwe), there was a statistically significant increase in perinatal mortality in the reduced visit model compared to the standard model (RR 1.15, 95%C.I. 1.01 to 1.32) (14). A 2013 secondary analysis of the WHO ANC Trial was inconclusive as to the cause of this increase,

[5] The primary fetal/neonatal outcome was low birth weight. The primary maternal outcome was a maternal morbidity index, including pre-eclampsia/eclampsia, severe postpartum anemia, treated urinary-tract infection.

[6] "Alternative" was defined as "reduced number of antenatal care visits, with or without goal-oriented care"

which was found to be significant between 32 and 36 weeks of gestation (21). Both high- and low-risk pregnancies[7], as classified by the study, suffered an increased risk of perinatal mortality. The authors of the secondary analysis conclude that "while it is plausible that [the higher risk of perinatal mortality in the reduced visit model] was due to reduced antenatal care visits, differences in settings, populations or content and quality of care, as well as the timing of visits could also play a role." (21) The WHO has not commented on the secondary analysis, but a 2011 WHO statement responding to the finding of increased perinatal mortality promotes careful monitoring and auditing of ANC, "with a focus on quality of care" (22).

Second, the adoption and adaptation of FANC encountered more challenges than success. A likely reason for this is the criteria used to select trial sites, which included highly-functioning ANC systems, with strong data and referral structures (23). Although not a stated criterion, the trial also relied on early and frequent care seeking. These were understandably important for the internal validity of the trial, but limited its external validity for countries with poorly-functioning ANC systems and limited coverage. FANC policy has been adopted in at least six sub-Saharan African countries and two Southeast Asian countries, almost all of which have been unsuccessful at improving quality of care to sufficient levels (24-30). On the care provision side, high staff turnover, poor and inappropriate training and lack of supplies and funding are blamed for FANC's lack of success. On the care recipient side, care-seeking patterns of less frequent (often below four) and late bookings have prevented the model from being implemented as designed in sub-Saharan Africa (31). The sole exception, Thailand, was part of the original trial and built strong national and regional collaborations before the trial started (24).

[7] The WHO ANC Trial considered women "high-risk" based on 18 possible conditions in a previous or current pregnancy or a general medical condition. 20% of women were classified as high-risk. Specific criteria can be found in Villar et al., 2001.

The state of ANC in the 2000's

The ANC knowledge base

Much of the 80-year debate focused on what ANC couldn't accomplish, rather than what it could. This is partially due to reviews performed in response to the SMI's dismal conclusions of ANC, which asked if and how ANC could affect the most severe (9, 32) or select outcomes (17, 20), rather than framing the question as "what can ANC achieve?" There is now a stronger evidence base for the benefit of ANC, which comes predominantly from well-designed and methodologically-sound studies of single ANC interventions and meta-analyses of these studies. Evidence from randomized trials shows that ANC interventions can reduce the incidence of LBW, premature births, maternal and neonatal infection (syphilis, HIV/AIDS and malaria), neural tube defects, anemia, pre-eclampsia and increase early initiation and continued breastfeeding (Figure 2.1) (33-38). These intermediate outcomes indisputably lead to final outcomes of reduced neonatal morbidity and mortality, maternal morbidity and mortality, perinatal mortality and improved cognition (39, 40). Additionally, randomized trials have shown that comprehensive community-based programs that include birth preparedness and emergency readiness and promotion of birth with a skilled birth attendant can increase knowledge and use of skilled care (41, 42). These community-based studies also show a reduction in neonatal mortality, but this can't be attributed to the birth preparedness and emergency readiness interventions alone, given the numerous components of the intervention and women's level of knowledge in these areas at the end of the study. Finally, the evidence base for antenatal education, its potential pathways of impact, the best means of delivery and content is not yet strongly developed, even though such education is promoted as an essential component of ANC (1, 2, 43).

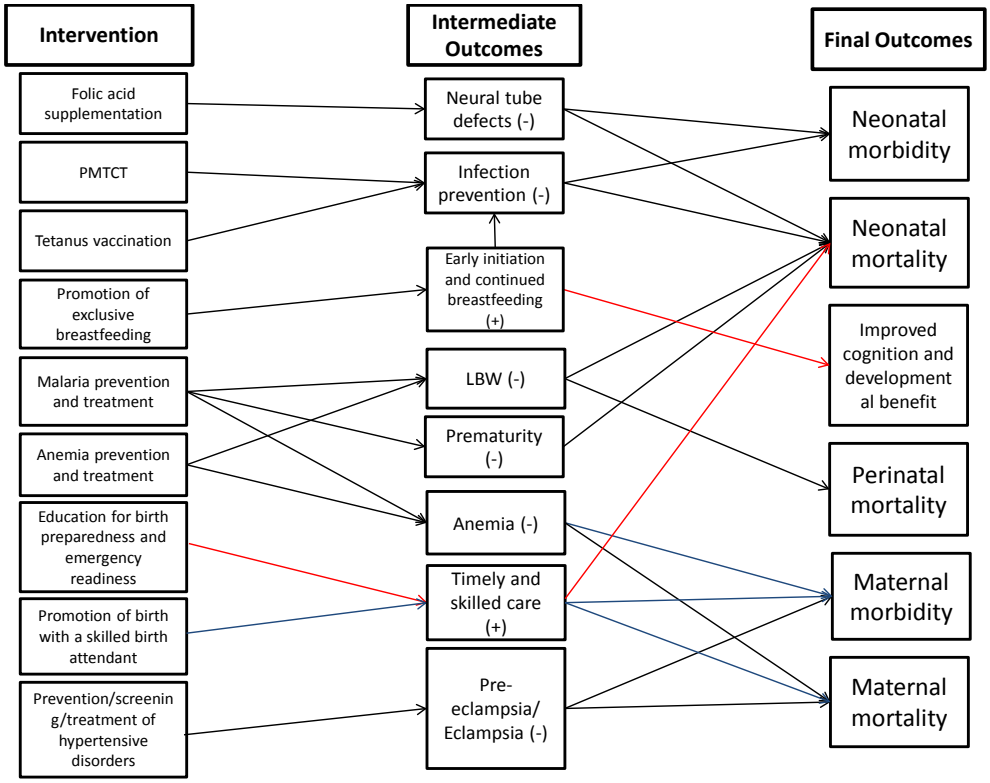

Figure 2.1 - Effect of select, high-impact ANC interventions
Direct of effect for Intervention on Intermediate Outcomes noted by (+) or (-)
Black lines – evidence from Cochrane Reviews
Red lines – evidence from individual randomized studies (single or multiple)
Blue lines – evidence from observational studies (single or multiple)
Supporting table with references and estimates of effect in Appendix 2.1
Note: Folic acid supplementation can reduce NTDs if periconceptional (before pregnancy through the first two months of pregnancy)

As the above summary indicates, there is good evidence about the effect of ANC interventions on intermediate outcomes but there are few studies that analyzed the effects of these individual interventions on final outcomes, often due to the need for unrealistically large sample sizes. The estimates that exist do not reflect the most up-to-date evidence reviews and care recommendations, such as iron folic acid (IFA) and calcium supplementation (33, 44). Of the estimates that do exist, antenatal care, including the physical exam, tetanus toxoid vaccine, detection and treatment of syphilis and pre-eclampsia, is estimated to reduce all-cause neonatal mortality by 10-20% (36). Intermittent

presumptive treatment of malaria is estimated to reduce 10-30% of all-cause neonatal mortality (36). Promotion of breastfeeding could reduce deaths in children under 5 years by 4% (37). Unfortunately, there is not an estimate for the effect of the ANC package on maternal morbidity or mortality. Generating such an estimate is feasible and might generate attention and funding to create ANC that will achieve these outcomes.

An additional gap in the current literature is study of ANC as a system or a cohesive "package of interventions"[8], as opposed to individual interventions or groups of select interventions. Simply extrapolating the benefit of individually tested interventions to a package of services may under- or overestimate the overall benefits due to "synergies and antagonisms between interventions." (45)

The Reality of ANC Today

Trends in utilization

The World Health Organization recommends a minimum of four ANC visits, which are designed around the ideal timing of efficacious services (2, 46). Reliable data about ANC utilization, timing and frequency are available from Demographic and Health Surveys (DHS), both Service Provider Assessments (SPA)[9] and household surveys, and UNICEF Multiple Indicator Cluster Surveys. These data indicate that there are large differences in ANC coverage by region and between and within countries. ANC coverage, defined by one and four visits, was 81% and 51% in 2011 in low-and middle-income countries, an increase of 18 and 7% respectively in the past 20 years (47).

[8] A "package of interventions" is referred to as a combination of interventions delivered in an integrated way, such as Integrated Management of Childhood Illness. Oliveira-Cruz et at., 2003

[9] DHS SPA are cross sectional surveys that include observation of client-provider interactions for antenatal care, performed by SPA field workers

Latin America and the Caribbean have the highest rates of at least one ANC visit, ranging from 86% in Haiti to 98% in the Dominican Republic. Sub-Saharan Africa has the lowest attendance of at least one ANC visit and the most variability between countries, ranging from 28% in Ethiopia to 97% in Tanzania and Zambia. In Latin America, 89% of women sought four or more ANC visits, but in Southern Asia, only 36% did. Sub-Saharan Africa is the only region where the percent of women seeking four or more visits did not increase between 2000 and 2011, albeit with large differences between countries.

There is disparity in timing of ANC uptake between regions and countries as well. The majority of women seek ANC in the first trimester in Latin America and the Caribbean and West Asia, but not in South/Southeast Asia or sub-Saharan Africa. Sub-Saharan Africa has the lowest percent of women who seek first-time care in the first trimester of pregnancy and the highest percent of women who seek first-time care in the third trimester, greatly decreasing the potential effect of many ANC interventions. In Senegal, only 4% of women sought care in the first trimester, compared to 57% in neighboring Ghana.

ANC quality

To achieve positive health outcomes, high ANC coverage must be coupled with good quality of care. Quality of care has been defined in numerous ways, in most cases reflecting accordance with national or international ANC guidelines. Both population-based (DHS SPAs) and smaller, observational studies have found that the quality of ANC varies tremendously across and within countries, and most often health care worker adherence to ANC guidelines is low (26, 48-51). While some services such as measurement of blood pressure are performed for almost all women, education and counseling activities are infrequently performed in most countries (30, 48, 52). A comparison of DHS data across 37 countries revealed that over 70% of women reported being informed about danger signs at least once in their last pregnancy in only three out of 37 countries (8%) (Figure 2.2) (48). In 24 of those 37 countries (65%), less than 50% of women reported being informed about danger signs (48). Receipt of iron folic

acid supplements, intermittent-preventive treatment for malaria, tetanus toxoid immunization and HIV testing were reported to be highly variable by country. Measuring blood pressure was the most consistent intervention performed at least one time to over 70% of women in 33 of 37 (92%) countries with data (48). Although not part of FANC, routine weight measurement continues to be commonly performed in many countries (26, 53).

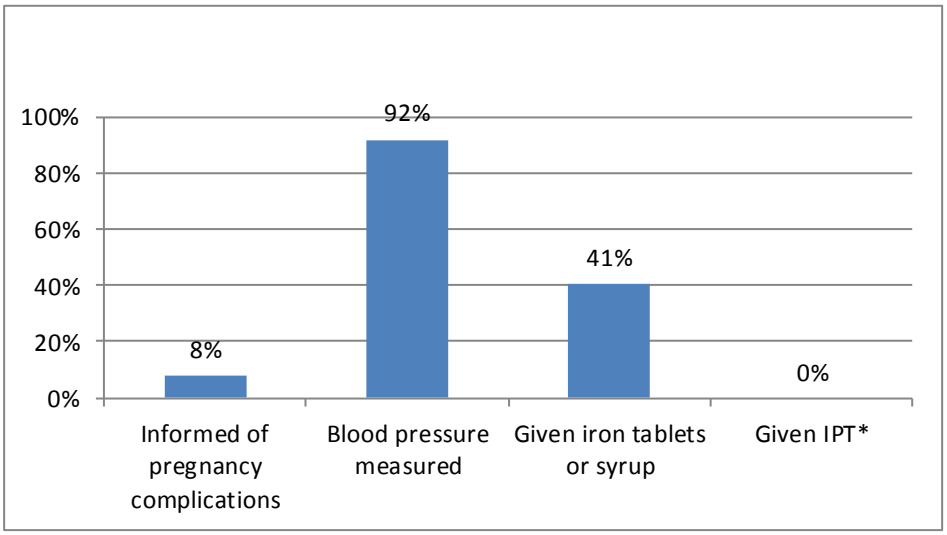

Figure 2.2 – Percent of countries where over 70% of women reported receipt of select ANC services at least once during last pregnancy
Source: Wang et al., DHS Comparative Report No. 26, 2011
Data from most recent DHS survey between 2002 and 2009
Data out of 37 countries for women with a live birth in the 5 years preceding the survey, except IPT which is relevant to 20 countries with malaria
All data is reported from maternal health card, if available, or self-reported
*IPT – took two or more doses, considered full treatment, for women with live birth in the past 2 years

Not often captured in the assessment of quality of ANC is referral care. Receipt of a referral and appropriate care received based on that referral are indicators of the strength of the ANC system and continuum of care, as opposed to individual provider behavior. Referral care is believed to be an important pillar of ANC, as some services performed during routine ANC are beneficial only if care at higher levels is accessible and functional. Only one study assessed the quality of the referral system since the risk assessment approach was phased out in the 1990s, and it found the patient compliance

rate with referral to be 45% (54). In order for referral to confer health benefits it is essential that women be referred according to guidelines and that appropriate care be provided at higher level sites. The above study did not examine these aspects.

Section 3 – Why does ANC not receive more attention?

Thus far we have identified many of the problems that have historically prevented the advancement of ANC and likely contributes to its poor implementation today, and noted that the evidence base for ANC interventions is stronger than ever before, showing clear benefits of ANC to women and babies. Yet ANC does not receive the same interest and action as other global health initiatives, prompting the question "why?"

To answer this question, we applied a framework that describes why some global health initiatives have gained traction in terms of attention, funding and action, while others do not (55). This framework, previously applied to the study of maternal mortality (55) and neonatal mortality (56), contains four categories of determinants that have helped these initiatives gain "political priority"[10]: 1. actor power, 2. ideas, 3. political contexts and 4. issue characteristics (Table 2.1) (55). Global health initiatives are hypothesized to gain political priority if they contain features in each of these categories (55), however, the relative importance of these categories is yet to be shown and is likely to vary by issue and setting (57).

Based on this framework, we highlight several barriers that we believe are important impediments to ANC's receipt of political priority. ANC suffers from a lack of a leadership by international level institutions, national level policy makers and civil society (actor power), ANC is unable to contribute

[10] "Political priority" is defined as "the degree to which international and national political leaders actively give attention to an issue, and back up that attention with the provision of financial, technical and human resources that are commensurate with the severity of the issue." (Shiffman and Smith, 2007)

directly and significantly to the main goals of MDGs 4 and 5 (political context), the complexity of ANC as health service not a vertical intervention (or indiscriminate combination of vertical interventions), a weak evidence base for ANC as a health service and socio-cultural issues that surround women's reproductive health (issue characteristics) and a lack of cohesive framing of ANC, in part due to lack of leadership (ideas). These barriers are intertwined and have likely exacerbated each other. Study of these determinants will not lead to a "quick fix" of ANC, but historical or current inaction should not lead to continued neglect. A better understanding of these barriers can lead to recommendations for future improvements of ANC.

Table 2.1: Four categories for the framework on determinants of political priority for global initiatives

Category	Description	Potential factors shaping political priority
Actor power	The strength of the individuals who affect the issue	1. Policy community cohesion 2. Leadership 3. Guiding institutions 4. Civil society mobilization
Political contexts	The environments in which actors operate	5. Policy window 6. Global governance structure
Issue characteristics	Features of the problem	7. Credible indicators 8. Severity 9. Effective interventions
Ideas	The ways in which actors understand and portray (or neglect) the issue	10. Internal frame 11. External frame

Adapted from: Shiffman and Smith, 2007

Barrier 1: Lack of leadership

Productive leadership for a global health initiative can take multiple forms, for example a small group of informal actors who led the neonatal survival community (56), a UNICEF-led partnership for child survival (58), or collaborations between public-private partnerships, UN organizations and civil society for HIV/AIDS. Each of these types of leadership models has been successful. Currently, however, there are no international, national or civil society leaders strongly promoting actions to strengthen ANC.

At the international level, no UN agency has taken the lead on ANC promotion (59) The WHO has not been a vocal advocate of ANC since the end of the FANC study, possibly because the movement towards more evidence-based recommendations is easier for individual interventions as opposed to a complex health service such as ANC. Other UN agencies such as the United Nations Children's Fund (UNICEF) and the United Nations Population Fund (UNFPA) state ANC's importance, but have remained close to their traditional areas of expertise (children or reproductive health, respectively) and not strongly promoted ANC (59).

There are numerous international disease- or risk-oriented global health groups who rely on contact between a woman and the health service during pregnancy, such as PMTCT, malaria and nutrition, but these groups are accountable for "their issue" and do not promote or invest in ANC as a whole. The wide-ranging effects of vertical programs dominating ANC is discussed below, but in terms of leadership, vertical programs are thought to result in competition for resources (18), creating barriers for the emergence of broad-based ANC leadership.

National level leadership for ANC has been limited, likely due to lack of international-level interest or pressure and competing demands from other health initiatives. Civil society leadership has been even more limited than national level leadership, possibly due in part to poor status of women in many countries and inequalities of distribution of care (59), leaving the most poor and remote with the least care.

Barrier 2: Influence of the MDGs

Signed in 2000, the MDGs have contributed to a number of accomplishments that have improved the lives of millions of poor people around the world. Between 1990 and 2010, the proportion of people living in extreme poverty was cut in half, less people suffered from chronic undernourishment and over

2 billion people gained access to improved drinking sources (47). The MDGs have been successful at galvanizing attention for poverty reduction, international development and health. Although successful in many ways, the MDGs have also been criticized as being fragmented and narrow in their conception and lacking a cohesive development vision (60). This is believed to have furthered promotion of more vertical health programs to accomplish the three "health MDGs" (MDG 4, 5 and 6) at the cost of health systems strengthening and integration (18, 61).

ANC is part of or relevant to two of the three health-related MDGs: MDG 4, the reduction of child mortality, and MDG 5, the reduction of maternal mortality and improvement of maternal health. Progress has been made towards both of these goals, but they are unlikely to be met by 2015 (62). Between 1990 and 2011 the child mortality rate dropped internationally by 41% (47). Wealthier regions such as Eastern Asia and Northern Africa have already met the MDG 4 goal, outpacing poorer regions (63). Early neonatal deaths (0-6 days) have been the slowest to decline, compared to late neonatal, post-neonatal and childhood deaths (62). MDG 5, originally focused solely on the reduction of maternal mortality, was expanded to include a second target of improved maternal health in 2005, which includes targets for ANC coverage, unmet family planning need, contraceptive prevalence rate and adolescent birth rate (64). Maternal mortality, as defined by the maternal mortality ratio, has declined by 47% between 1990 and 2011 (62).

Given the attention the MDGs have received, they have influenced the global health landscape over the past decade, creating a policy window for certain groups to promote or reinvigorate their strategies (55). Strategies and interventions that were thought to address the goals directly and quickly became high priorities, gaining both political priority and funding. ANC has not gained much attention during this time, likely because it was not promoted as a priority intervention for either MDG 4 or 5.

Priority interventions to reduce the under-five mortality rate (MDG 4) relied heavily on strategies known to reduce child survival, including immunization, Integrated Management of Childhood Illness (IMCI), Infant and Young Child Feeding (IYCF) and insecticide treated nets for the prevalence of malaria. Strategies to reduce the maternal mortality ratio (MDG 5) focused almost exclusively on skilled care during childbirth, including availability of Emergency Obstetric Care (EmOC) (65, 66).

The publication of the various *Lancet* Series on Neonatal, Child and Maternal Survival were also highly influential in guiding strategies for the MDGs, providing decision makers with up-to-date reviews of interventions and, where available, effectiveness and cost-effectiveness estimates for each intervention on mortality. The series on Neonatal Survival emphasized the potential effect of ANC to reduce neonatal death in addition to the effects of individual interventions (36). However, the Maternal Survival series focused solely on the reduction of maternal mortality, not maternal health, and concluded that although ANC had benefits to women and babies, ANC had "limited potential to affect maternal mortality ratios" (45). It was therefore not promoted as a primary intervention for MDG 5. When MDG 5 was expanded to include maternal health, political priority was already established and focused around intra-partum care and EmOC and the advocacy and funding flows were not expanded accordingly.

Approaches such as those used in the *Lancet* series tend to highlight individual interventions rather than support efforts to strengthen health systems. It is now recognized that the health MDGs will only be reached through improvements in health systems, including alternative delivery models such as outreach and community-based care, as faster, easier-to-implement interventions received by those who have access to the system have reached their full potential and exacerbated inequality (67, 68). This is especially relevant for the reduction of early neonatal deaths, which will require stronger ANC.

Another likely reason that ANC did not gain attention as a priority intervention for MDG 4 or 5 is the short time frame combined with outcomes that focused on mortality, which directed attention to more direct than underlying causes of child and maternal mortality (69). Similar to undernutrition, which is an underlying cause of 45% of child mortality (70), lack of ANC can be thought of as an underlying cause for both neonatal and maternal mortality. As shown in Figure 2.1 and Appendix 2.1, many of the benefits of ANC are best documented for intermediate outcomes, with varying strengths of evidence for effect on mortality.

Barrier 3: ANC issue characteristics

The third barrier to ANC gaining political priority relates to characteristics of ANC. Generally, issues that pose a severe health burden and have interventions that are efficacious, cost-effective, and are easy-to-implement and monitor gain the most attention by decision makers (55). In contrast, ANC is a complex health service, comprised of multiple interventions that affect numerous outcomes. Furthermore, some ANC interventions involve complex educational and behavioral pathways. This complexity makes ANC a challenge to promote and assess comprehensively. Additionally, there is currently a weak evidence base for implementation of *packages* of care and there are complex socio-cultural aspects of gender and pregnancy that affect policy-makers, care providers and women's behavior.

The severity of the problem, in this case lack of or weak ANC, is not an easy one to express compared to diseases such as HIV/AIDS or malaria with clear morbidity and mortality burdens. Lack of ANC can result in maternal and neonatal morbidity and mortality, but ANC can't reduce the majority of either of these. It can, however, reduce significant portions of morbidity and mortality, while leading to positive outcomes in numerous areas, including early and continued breastfeeding. Unlike other global health interventions, ANC does not have quantitative data for effectiveness on final outcomes, DALYs averted or cost-effectiveness data. Additionally, there remains uncertainty about the ideal package of ANC

services in light of the finding of increased perinatal mortality in reduced-visit models of care. Given this, it is difficult to convince policy makers that ANC can be an effective, worthwhile investment.

The challenging characteristics of a complex health service have also driven many to focus on shorter-term, easily-quantifiable goals. For example, in many countries ANC has become a platform for vertical interventions such as HIV/AIDS testing and preventing mother-to-child transmission (PMTCT), malaria prevention and treatment, family planning, educational interventions for reducing maternal mortality or nutrition interventions, while other ANC services are deprioritized or neglected. Evidence of this can be seen by highly variable ANC services provided within and across countries (48). In some countries or regions, PMTCT is well implemented, but basic screening or prevention of pre-eclampsia or birth planning are neglected, while in others IPT for malaria functions well, but most women do not receive IFA.

Health systems strengthening has received substantial attention in the past decade, promoted by the WHO, World Bank and global health initiatives such as The GAVI Alliance, the Global Fund and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) (71). However research and funding progress in this area have been weak (37, 67), including in maternal health (18). There are few widely-accepted methods to study health systems and many health researchers avoid straying from widely-accepted experimental designs, for fear of criticism or loss of funding, publication opportunities and credibility (18). Without an agreed upon mandate, ANC and other health services will likely continue to be broken up into smaller, vertical programs or packages of care.

A final important issue characteristic is socio-cultural factors about pregnancy and sexuality that could influence the behavior of decision makers and certainly influences women's utilization of ANC. Views of pregnancy are culturally embedded and affect the perception of the need for care and the timing and frequency of care seeking. For example, in some areas, women may delay care for fear or shame of

disclosure of pregnancy while others may chose not to attend ANC because they perceive pregnancy as a normal, healthy state (72). Women's education level, husband's education level, women's autonomy and positive treatment by ANC staff are also positively correlated with seeking ANC (72, 73).

Barrier 4: Lack of cohesive framing for ANC

All global health issues have some intrinsic characteristics and some characteristics ascribed by leaders hoping to increase the issue's political priority. Internal and external frames are strategically constructed by leaders to allow cohesion (the internal frame) as well promote concern and commitment on the part of decision makers (external frame). ANC lacks strong framing, both internal and external. The lack of leadership of ANC allowed other actors, such as the Safe Motherhood Initiative, to dictate the internal and external framing to a large extent, based on conclusions they made about the effect of ANC on their outcome of interest. With no ANC leadership to balance these statements, and no broader frames within which to weigh them, these became the "default" framing of ANC for decades.

A commonly-applied and powerful framing technique is the use of quantitative measures, such as effectiveness, cost-effectiveness and DALYs of an issue. However, as previously mentioned, these do not currently exist for ANC. The weakness of both comprehensive evidence for ANC effectiveness (as opposed to vertical interventions) and models for implementation also impede ANC's framing and advancement. Framing could also draw on advantageous issue characteristics such as who is affected by lack of ANC, who stands to benefit from improved systems, human rights approaches including gender rights, or the complementarity of ANC to other global health issues and trends through ideas such as the continuum of care. ANC could be framed in any number of powerful ways, but this opportunity has not yet been grasped.

Box 1 - An example: Calcium supplementation in Ethiopia and Kenya

In 2013, the World Health Organization released new guidelines recommending that women living in areas with low calcium consumption be given calcium supplements to reduce the risk of pre-eclampsia. The WHO recommendation is based on two recent Cochrane systematic reviews of that concluded calcium supplementation in pregnancy reduced the risk of pre-eclampsia [RR 0.45 (0.31-0.65)] and high blood pressure [RR 0.65 (0.53 to 0.81)] in women and had no adverse effects on the mother or infant (74).

Little implementation guidance accompanies this recommendation, making it unclear how best to integrate and implement calcium supplementation into ANC systems in target countries. The Micronutrient Initiative and Cornell University are collaborating to test the feasibility and acceptability of this recommendation in Ethiopia and Kenya. This research will identify and test of strategies for implementation, such as the development of health staff training and behavior change communication materials that will inform eventual translation of the WHO guidelines into national policies and program implementation. The research is focused on facility-based ANC services in Kenya and community-based health extension services in Ethiopia.

This research is ongoing but numerous implementation challenges have already been identified about this seemingly straightforward recommendation. For example, at the national level, the governance structure of the Ministries of Health can lead to problems in procurement of prenatal micronutrients such as IFA, in part due to the need for coordination among three departments (reproductive health, nutrition and pharmacy). ANC addresses women's health and care needs during the life stage of pregnancy, but the Ministries of Health in Kenya and Ethiopia are set up by sector which complicates management of recommendations that require integration of effort and resources. National-level leadership will be required to prioritize prenatal calcium supplementation if it is to become national policy and be fully implemented to reach pregnant women in these countries.

Given the similarities between IFA and calcium supplementation and the lack of current calcium supplementation in these countries, much of the formative research at health centers and in communities has focused on IFA delivery. Both IFA and calcium supplementation have been shown to be efficacious, yet to be effective as an intervention both require reliable supply chains, consistent protocols for provision the supplements, early and regular ANC attendance, and an education and behavior change component. In combination, these requirements can achieve maximum impact, but if any one of them is poorly-functioning, it can severely limit the micronutrient's benefit.

In both Kenya and Ethiopia, formative research revealed that poor ANC attendance has reduced the potential impact of IFA and could similarly affect calcium supplementation. Attendance is poor because ANC is not perceived by women as essential care, but rather is only needed if a woman becomes ill during pregnancy. This is partly because pregnancy is seen as a normal condition, not as an illness, and the potential preventive value of ANC services for mothers and children is not appreciated. Formative research also revealed cultural and religious factors that contributed to reluctance to disclose pregnancy early and attend ANC clinics. Due in part to some of the challenging issue characteristics of ANC, it has not been sufficiently accessible or high-quality to change norms around care during pregnancy and to develop an image as a supportive and valuable health service. A lack of trust characterized relationships between ANC providers and their clientele, and heavy workloads, time constraints, lack of equipment and training reduced satisfaction of providers and patients.

The challenge of implementing IFA reflects the lack of clear lines of authority for ANC and a system that is under-resourced and functions poorly in many areas. A system that cannot reach women and deliver IFA is not a promising platform for the implementation of a new intervention like calcium supplementation. These initial findings highlight the need to strengthen the ANC systems in these countries in order to make calcium supplementation, or any future recommendation, effective.

Section 4 – Suggestions to move ANC forward

In light of the perplexing history of ANC and also its potential to improve health outcomes, we offer several potential actions. Just as the barriers are intertwined, so are the potential solutions to overcoming these barriers. Thus they are likely to be most effective in concert.

1. Leading ANC into the future

To gain political priority, ANC will require research, advocacy and coordination, and increased funding. None of these will happen without strong leadership. An encouraging development is the concept of the continuum of care for women and children, being promoted by the Partnership for Maternal, neonatal and Child Health (PMNCH) within the WHO. The continuum of care recognizes that functional health systems are essential for achieving better health outcomes for women and children of all ages and in varying locations (households, communities and health centers). If this concept is fully embraced, there is a logical place for ANC and health systems strengthening for maternal and child health more broadly.

2. Transforming the lessons learned from the MDGs to improve ANC

Although the MDGs did not strengthen ANC, attention has already turned to the "post-MDG" era, the main question being "what comes next?" There is growing consensus that any future goals should be designed in a way that can achieve greater equity, sustainability, human rights and country ownership, the lack of which are seen as flaws in the current MDGs (60, 69, 75). Broadening how health is defined in future global health goals will shape the strategies prescribed to achieve them.

A UN System task force on the Post-2015 Development Agenda proposes broad health indicators that capture mortality but include measures of well-being (69). Unlike the current mortality-outcome based MDGs, this type of health goal would be more reliant on health services such as ANC to provide wide-

ranging preventive and curative care and would be likely to incorporate multi-sectorial approaches to health.

3. Review of ANC and FANC evidence, including implementation research and guidance on strengthening the ANC system

The finding of increased perinatal mortality in reduced visit ANC models like FANC and the lack of large-scale successful adaptation of FANC point to a need to revisit evidence in these areas, something the WHO is well-positioned to do. The lack of tangible conclusions about why perinatal mortality was slightly increased for women in the reduced visit models is unsettling and merits further study. The current recommendation to "proceed with caution" is not sufficient to convince decision-makers of FANC's worth.

It is also currently unclear if the FANC model can and should be adapted in countries with weak health systems, as there are few success stories to date. Current promotion of ANC is divorced from the reality of weak health systems and the real reluctance of pregnant women to access them. For example, there is a mismatch between health care worker training and skill sets and the demands of the FANC model. FANC has a large, and time-consuming, counseling and education component, but this has been especially weak, both in terms of frequency and quality of delivery and knowledge outcomes (28, 30, 48, 52). What training and support need to be in place to enable implementation of FANC? What educational approaches are most effective in different contexts? These types of questions would require contributions from health systems research and translational science and are critical for advancement of ANC systems.

Current recommendations about ANC by the WHO include the FANC model and also individual interventions that are reviewed and updated on an on-going basis at the Reproductive Health Library

(76) and the e-Library of Evidence for Nutrition Actions (77). It is not clear how or if these interventions should be combined with FANC or other ANC services and is potentially confusing to national-level decision makers and practitioners. Designing packages of care based on tested models would be ideal.

An area especially pertinent to ANC strengthening is the continuum of care across locations where women and children need and seek health care. Outreach and community-based interventions have been effective for numerous comprehensive maternal and neonatal health and nutrition outcomes (34). The development of ANC packages could integrate alternative models of care with health centers, possibly experimenting with different delivery systems and roles that can be best played by each.

Finally, understanding of socio-cultural aspects that affect women's behavior is essential to better delivery of ANC services and would need to region and country specific. There has been significant work in this area, but the findings are seldom incorporated into care design and delivery (72).

4. Framing ANC effectively

DALYs estimate health loss based on risk and causes of disease, disability and death and are commonly used and understood by researchers, policy makers and technical agencies. There is currently not an estimate for the deaths or DALYs that could be averted for maternal or neonatal outcomes if women receive high-quality ANC. Having a quantitative estimate of benefit is not a guarantee of obtaining political priority (55), but given historical skepticism regarding the value of ANC and its potential effects, building a strong evidence base in line with other health interventions is essential to the discourse. A DALYs-averted calculation for ANC could justify decisions in terms of population need and cost-effectiveness.

Two pieces of information are needed to calculate the DALYs averted by ANC. First is the effect of ANC-relevant maternal and neonatal disorders and risks on disability, disease and early death. These are well

established by the Global Burden of Disease Project for many, but not all, relevant outcomes (78, 79). Second is the effect of high-quality ANC on reducing these conditions at different coverage levels. Although there is better evidence for some interventions than others, mostly for single interventions, initial estimates could be made and revised as further evidence is added. The need for studies that estimate the effect of various ANC packages on DALYs-averted poses an opportunity for research.

Section 5 - Conclusion

Historically ANC has lacked of rigorous assessment and suffered from mistaken perceptions about what it could accomplish. This led to ANC not being valued as a health service and prevented it from gaining political priority. Evidence is now strong that primary care for pregnant women is essential and has numerous proven benefits to women and babies, and therefore improving ANC systems is necessary and could have multiple payoffs. We propose several actions that could be taken in the short- and long-term to improve ANC systems, including generating leadership for ANC, designing future health goals that prevent short-sighted incentives for health programs, researching and promoting ANC as a system and adding to the evidence base for ANC by calculating DALYs-averted. These steps do not require large financial investments or new technologies, but will require a long-term vision, political will and implementation research. These actions could contribute to substantial improvements in the health and well-being of countless women and children, if combined with parallel efforts to strengthen national ANC policies and delivery systems.

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APPENDIX

Appendix 2.1: Supporting Table for Primary Interventions in Figure 2.1

Condition/Illness	Screening/Intervention	Level of evidence	Primary benefit	Pathway to final outcome	Final Outcome	Estimation of effect	Note
Folic acid deficiency	Folic acid supplementation, if periconceptional (before pregnancy through the first 2 months)	Cochrane Review	Infant	Neural tube defects	Neonatal morbidity	Reduction in the risk of neural tube defects RR 0.28(0.15-0.52)(80)	
Iron deficiency/iron deficiency anemia	Iron supplementation (with/without FA)	Cochrane Review	Both	Decrease LBW, reduce VPTB	Maternal mortality, neonatal morbidity/mortality	Reduction in LBW RR 0.81(0.68-0.97, Reduction of anemia at term RR 0.30(0.19-0.46) Reduction of iron deficiency at term RR 0.43)0.27-0.66)(81)	

Hypertensive disorders (Hypertension, pre-eclampsia, eclampsia)	Ca suppl, low dose aspirin (targeted to women at high risk of pre-eclamsia), magnesium sulphate;	**All outcomes:** Cochrane Review	Both	**Ca suppl:** Reduction in hypertension, pre-eclampsia, and preterm birth **Low dose aspirin:** Reduction of pre-eclampsia **Magnesium sulphate to prevent eclampsia:** Reduction of eclampsia **Magnesium suplphate to treat eclampsia**	Maternal, neonatal, perinatal mortality	**Ca suppl:** Reduction in risk of pre-eclampsia RR 0.45 (0.31-0.65) Reduction in risk of preterm birth RR 0.76 (0.6.-0.97)(74) **Low dose aspirin:** Reduction of pre-eclampsia RR 0.82 (0.76-0.89)(82) **Magnesium sulphate to prevent eclampsia:** Reduction of eclampsia RR 0.41(0.29-0.58)(83) **Magnesium sulphate to treat eclampsia:** Reduction of maternal mortality RR 0.59(0.38-0.92) Reduction of recurrence of convulsions RR 0.43 (0.33-0.55)(83)	No studies for the effect of screening for pre-ec/ec (BP and proteinuria) identified

HIV/AIDS	PMTCT: Treatment with ARVs (Pregnancy, birth, postpartum, during breastfeeding) Breastfeeding vs non-breastfeeding populations	**All outcomes:** WHO estimate based on meta-analysis	Infant	Reduction of disease transmission	Morbidity/Mortality	2010 WHO Guidelines could reduce the risk of MTCT to less than 5% (or even lower) in breastfeeding populations from a background risk of 35%, and to less than 2% in non-breastfeeding populations from a background risk of 25%(38)	The 2010 Cochrane Review entitled Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection includes estimates of effects for multiple classes of drugs and specific regimens within these. Given the wide range of regimens, estimates from the WHO Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants: Recommendations for a public health approach (2010 version) are reported.
Syphilis	Screening with penicillin treatment, dependent on rate of infection	**All Outcomes:** Systematic review including 25 observational studies	Both	Congenital syphilis Stillbirths Pre-term birth	Neonatal morbidity and mortality Maternal morbidity	**Screening and treatment on reduction of:** Congenital syphilis RR 0.03 (0.02-0.07) Stillbirth RR 0.18 (0.10-0.33) Pre-term birth RR 0.36 (0.27-0.47) Neonatal mortality RR 0.20 (0.13-0.32)	"Low" to "moderate" quality of evidence (by GRADE standards), partially due to ethical limitations of treatment comparisons. Some studies controlled for important confounders (other infections, adherence to treatment), while others did not (Blencowe et al., 2011)(84). Estimates assume 15% of livebirths from syphilis-

							effected pregnancies result in neonatal death from congenital syphilis and that treatment does not affect case fatality.

Malaria	Malaria prevention and treatment (IPTp and insecticide treated bednets)	**All Outcomes:** Cochrane Review	Both	Infection LBW Pre-term birth Maternal anemia	Perinatal death	**IPTp** Reduced perinatal deaths RR 0.73 (0.53-0.99) Reduced severe maternal anemia RR0.62(0.50-0.78)(85) **Insecticide-treated nets** Reduced low birthweight RR 0.77 (0.61-0.98) and stillbirth/abortion RR 0.67 (0.47-.97) (up to 4th pregnancy, in sub-Saharan Africa) (86)	
Tetanus	Vaccination(2+)	**Estimated reduction in all cause neonatal mortality:** Meta-analysis **Estimated reduction in tetanus mortality:** Meta-analysis	Infant	Neonatal tetanus	Neonatal mortality	Estimated reduction in all cause neonatal mortality: 33-58%(87) Estimated reduction in tetanus mortality – 88-100% (36)	The 2013 Cochrane Review on this topic identified only two randomized studies from 1966 and 1980, both of which compare TT or Td to another vaccine (88). Therefore, RRs not included in results.

Breastfeeding initiation	EBF promotion	**Early initiation:** Cochrane Review **Reduction of neonatal mortality:** Observational **Reduction of infant mortality:** Observational **Improved cognition:** Single RCT; meta-analysis including observational studies	Infant	Early initiation and continued breastfeeding	**Reduce neonatal mortality and infant mortality**	**Effect of health education interventions on early initiation** RR 1.57 (1.15-2.15)*(89) **Reduction of neonatal mortality** *Early initiation of breastfeeding* Within 1 hour compared to Day 2 aOR 2.70 (1.70-4.30)(90) *Exclusive breastfeeding* Exclusive breastfeeding compared to partial breastfeeding aOR 4.51(2.38-8.55)(90) **Reduction of infant mortality** Breastfeeding vs no breastfeeding for all infectious disease deaths RR 3.23 (2.18-4.78)(91) **Improved cognition:** Increased Weschler Intelligence Scale for Children scores(92); Increased mean difference in cognitive scores in breastfed children 5(39)	

Birth readiness/emergency preparedness	Community-based maternal education including maternal education on birth preparedness, thermal care, breastfeeding promotion and danger sign recognition compared to usual services.	Single RCT	Both	Increase in knowledge and skilled care when needed, leading to timely and skilled care	Reduction of neonatal mortality	Reduction of neonatal mortality RR 0.46 (0.35-0.60) (42)	Although neonatal mortality was reduced in this study, birth preparedness knowledge indicators were low at the end of the study, pointing to other aspects of the intervention that likely reduced neonatal mortality. Non-randomized trials have also shown effect of increased timely and skilled care when *both* supply and demand factors were improved.
Birth with a skilled birth attendant	Promotion of birth with a skilled-birth attendant	Quasi-experiemental study	Both	Timely and skilled care	Reduction of maternal morbidity and mortality and reduction of neonatal mortality (no direct evidence)	Receipt of high quality antenatal care increased the odds of birth with a SBA OR 3.97 (1.96, 8.10)(93)	

*Cochrane review includes only US-based trials, none in middle or low-income countries were located

Chapter 3 - Comparison of quality of antenatal care between a traditional and alternative delivery model in Haiti

Abstract

Antenatal care (ANC) is an important health service for women in developing countries, with numerous proven benefits. Global coverage of ANC has steadily increased over the past 30 years but commensurate improvements in health outcomes have not been achieved, indicating that quality of care may be inadequate. A proposed strategy to further increase coverage of ANC is mobile clinics, but the quality of this alternative ANC delivery model has not been evaluated and its effectiveness is therefore unknown. To determine the quality of care in mobile clinics in Central Haiti, we compared quality between traditional (fixed) and mobile clinics by performing direct observations of antenatal care consultations and exit interviews with recipients of care using a stratified, cluster-randomized sample. Outcome variables were eight components of care and knowledge and satisfaction with care. We found that quality of care was relatively poor in both clinic models. There were slight but statistically significant differences in the percent of intake questions asked (28% in fixed vs 23% in mobile clinics) and in predicted probabilities that supplies, supplements and tetanus toxoid were provided (99 vs 100%). There were large and significant differences in predicted probabilities of lab exams were performed (39% vs <.01%) and if infection prevention measures were performed (74 vs 1%). The percentage of services provided to women according to the Haitian guidelines for the physical exam, education and counseling, and interpersonal relations were moderate to low in both clinic models, with no significant differences between them. Women's knowledge about educational topics was poor, but perceived quality ratings by care recipients in both clinic models were high. Although there were statistical differences in some care components, the similarities of provider behavior and outcomes between clinic models suggest efforts to improve provider performance and quality in mobile

clinics should be comparable to such efforts in fixed clinics. Alternative delivery models for ANC such as mobile clinics have potential to link increased coverage with improved health outcomes, if high-quality care can be consistently delivered.

Introduction

Antenatal care (ANC) is a package of services delivered to pregnant women that can contribute to multiple valued maternal, perinatal and fetal health outcomes. Despite the demonstrated efficacy of many of the interventions that are part of routine ANC (1-5) and an increase in the proportion of pregnant women who seek ANC over the past 30 years (6, 7), the prevalence of many of many preventable or treatable ante-, peri- and post-natal conditions remains high (8). In developing countries the prevalence of maternal anemia is over 40%, 27% of babies are small-for-gestational age and 40% of deaths in children under 5 (2.9 million) take place in the neonatal period, a significant proportion of which can be reduced through antenatal care (9-11). Insufficient coverage of vulnerable groups, inadequate number of visits and poor-quality care contribute to these persistent poor health outcomes (7, 12, 13).

Mobile clinics that travel to rural areas or locations far from health centers have the potential to increase coverage of ANC by improving access to care. Mobile clinics and similar community-based outreach are promoted in *Lancet's* Series for Maternal Survival, Neonatal Survival and Maternal and Child Undernutrition as a potentially effective delivery strategy for efficacious interventions (1, 3, 5). However, documentation of their implementation and evidence of their impact to improve ANC outcomes is weak. Mobile clinics are associated with earlier and increased initiation of ANC, but are inconclusive for pregnancy outcomes in the United States and in one Sub-Saharan African country (14-16).

Quality of health care and health provider performance indicators in developing countries are increasingly monitored to increase accountability of providers and health programs, for impact evaluation and policy-related research (17). Quality of healthcare, including ANC, does not have a single definition or measure, and researchers have operationalized quality in myriad ways (18-22). A common approach to assessing quality of care is the systems model developed by Donabedian (23), which assesses structure, process and outcomes of care, with the assumption of the interconnectedness of these three components; high-quality structure increases the probability of high-quality processes, which in turn increases the probability of desirable outcomes. Not only can the technical and interpersonal process of ANC delivery affect health outcomes, it can also can influence utilization and timing of ANC uptake and potentially increase facility delivery, the primary strategy for reduction of maternal mortality (24, 25). Whether delivered at traditional fixed clinic or through an alternative delivery model such as mobile clinics, ANC can only be effective if delivered with high-quality, making its assessment and quality assurance processes important components of study.

The World Health Organization (WHO) promotes the "focused antenatal care" (FANC) model of care (26). The adoption of FANC in Sub-Saharan Africa has encountered challenges such as high staff turnover, low provider-to-patient ratio and lack of training, equipment and supplies, which have led to poor implementation of the model (27-31). Additionally, many countries have not yet adapted FANC, relying on out-of-date recommendations that lack the evidence base of FANC (32-34).

Haiti is one such country. Instead of the FANC-recommended four visits at specific times during pregnancy, with content specific to the timing of visits, the Haitian government recommendations three visits, one each trimester (35). Twenty-four percent of the 62 recommendations in the Haitian guidelines for the ANC consultation are in agreement with FANC recommendations, although the Haitian guidelines are not clear about the stage of pregnancy at which these services should be delivered.

ANC coverage in Haiti is high compared to similarly developed countries (36). In the department of the Central Plateau, 94% of women seek at least one prenatal care visit with a skilled provider, the highest in the country (37). In this department, ANC is delivered through a patchwork of government, nongovernmental organizations (NGOs) and jointly-managed health clinics. This setting provided an opportunity to assess and compare the quality of ANC delivery in two models of care: fixed and mobile clinics. This context is similar to others in developing countries where the health infrastructure is weak and loosely-coordinated, NGOs implement health programs to complement government programs and poor maternal, fetal and neonatal outcomes persist.

In the study reported here, we used a cross-sectional design to assess and compare the quality of antenatal care between fixed and mobile clinics, including educational outcomes and the perceived quality of ANC by care recipients (23). The potential effectiveness of community-based and outreach services depends not only on the coverage of such services but also on the quality of care provided to women. Our study is the first to comprehensively assess and compare quality of care in a community-based delivery model with traditional health care centers.

Methods

Study setting

The study took place in 10 of the 12 communes in the Central Plateau of Haiti, where there are 17 fixed (non-mobile) health centers that provide routine (non-emergency) antenatal care, including primary, secondary and tertiary level facilities. Thirteen of these health centers receive financial, logistical and/or human resource support from non-governmental organizations. In addition to these fixed health facilities, the NGO World Vision (WV) implements a USAID-funded Title II Food Security Program in the Central Plateau and two other departments. This program provides ante- and post-natal care at mobile clinics in addition to other food-security activities. Mobile clinics are performed by on a monthly basis at

a predetermined time and place in WV's program communities. Mobile clinics are staffed by health professionals, ranging from auxiliary nurses to nurse-midwives, who travel to communities on a monthly basis and host clinics in churches, schools or private homes. At the time of the study, 130 mobile clinics were held each month. Food distribution as part of the World Vision Title II program is conditional on participation in mobile clinics and related maternal and child health and nutrition activities.

Study Design

This study used a cross-sectional deign with stratified, cluster-randomized sampling. All fixed clinics that provided ANC at a regularly scheduled time and typically received more than five women per day were included in the sampling frame. For each fixed clinic, two mobile clinics were randomly selected from a stratified sample based on distance to the fixed clinic (less than and greater than two hours walking distance from the fixed clinics). Estimations of walking distance were made by the regional nursing staff with verification from local program staff.

Assessment of Quality of Care

We applied a definition of quality of care that includes both provision of care and perception of quality of care received: " quality of care is the degree to which maternal health services for individuals and populations increase the likelihood of timely and appropriate treatment for the purpose of achieving desired outcomes that are both consistent with current professional knowledge and uphold basic reproductive rights" (38). We operationalized this definition by creating a rubric of ANC quality based on the structure, process and outcomes model, incorporating women's knowledge and perception of quality as care outcomes (Appendix 3.1) (20). The rubric contains eight care components of ANC identified by the authors from a literature review of ANC recommendations and guidance from WHO and JHPEIGO (Table 3.1) (26, 39-41). Based on this rubric, we created structural, process and outcome (immediate, intermediate and long term outcomes) indicators used in our observation instrument that

were based on FANC recommendations and Haitian national guidelines (Appendix 3.2). Because Haitian ANC Guidelines differ substantially from FANC guidelines, the determination of quality in this paper is reported by comparison to only the Haitian guidelines (35).

Table 3.1 – Care components designed to assess quality of care

1. Intake (detailed taking of medical and obstetric history)
2. Physical exam
3. Lab exam
4. Distribution of supplies, iron-folic acid and Tetanus Toxoid vaccine
5. Educational messages and counseling
6. Health provider communication and interpersonal delivery
7. Infection prevention and control
8. Documentation

Direct observations (rather than provider or patient recall or chart reviews) are considered the "gold standard" for assessing quality of health care implementation because they reduce potential risk of recall bias and poor or incomplete documentation (42, 43). However, observations are limited by what can be visually or audibly assessed, and have the potential to alter client and patient behavior (42). The focus of this paper is on process indicators of care and immediate outcomes of ANC because these indicators provide information that is actionable with the potential for immediate improvement.

Consultation Duration

The duration of ANC consultations was recorded to compare real-world practice with national and WHO guidelines. Both FANC and the Haitian ANC Guidelines state recommended consultation durations, although neither explains how these were derived (26, 35). The recommendation for the first visit is between 30-40 min by FANC and 10-15 min by Haitian Guidelines. Follow-up visits are estimated to last 20 min by FANC and 5-7 min by Haitian Guidelines. Presumably, intensive medical and history taking, and education and counseling explain the lengthened duration of FANC visits (26, 27).

Selection of Health Centers and Study Participants

Administrative permission was obtained from all health centers before the start of the study. ANC providers within these institutions were eligible to participate in the study if providing routine ANC was part of their daily activities. Observers typically spent two days in each fixed health center and one day in each mobile clinic. If there was more than one provider at a clinic, the observer attempted to observe multiple providers whenever possible. Oral informed consent was performed with all health care providers prior to inclusion in the study (Appendix 3.3).

Women who received an ANC consultation on the day(s) that study staff was at a clinic were asked to participate in the study. ANC recipients 18 years of age or older who presented for a routine ANC visit were eligible to participate in the study. Women who presented with an emergency or for receipt of test results only were excluded from the study.

A random sub-sample of women whose consultations were observed were also invited to participate in an exit survey as they departed the clinic, performed predominantly with personal digital assistants (PDAs) (Appendix 3.4). Enumerators randomly selected women at a regular time interval as she left her consultation.

All women were asked to participate in the study using two separate oral informed consents, one for the observation of her ANC consultation (Appendix 3.5) and the second for her participation in the exit survey (Appendix 3.6). This research study was approved by the Cornell University Institutional Review Board and the Haitian Ministry of Health (MSPP) Public Health Bioethics Committee.

Data collection and analysis

Three observers and five enumerators were trained in their respective roles during a two-week training that included two days of hands-on practice in a health center outside of the study region. Data

collection took place between June and August 2012. All research activities were performed in Haitian Creole.

Study observers were instructed to sit in an unobtrusive spot of the consultation room and interact with the provider or client as little as possible to minimize a potential "observation effect." There were, however, three questions on the observation tool that required the observer to speak with the care provider either at the beginning or the end of each consultation: if it was the client's first ANC visit at that health center, the patient's first time pregnant and the number of months pregnant. All observations were recorded on paper and entered into CSPro (US Census Bureau, Version 4.1) (44).

Study staff did not observe interactions between clients and other staff outside of the consultation room. Inter-rater reliability was assessed by performing simultaneous observations with the head researcher (EP). All observers had above a 95% percent of agreement with the head researcher, with an average kappa statistic of .92, .94 and .94 for the three observers. This extremely high level of agreement beyond chance is likely due in part to the skewedness of variables and lack of variation in provider behavior (45). However, it was found that two questions (checking the woman's conjunctiva and palpation of abdomen for fetal presentation) had poor reliability and were dropped from the analysis. A third question related to disposal of medical waste was partially dropped from the analysis due to observer confusion.

The sample size calculation for observations were based on a two-tailed test of sample means (fixed vs. mobile) for the physical exam portion of the consultation, with an effect size of 0.25 and assuming an alpha of 0.05, power of 80%, and a design effect of 1.96[11]. This outcome was selected because it was hypothesized to have the least variation between providers and would therefore require the largest

[11] The design effect was estimated using an ICC of 0.04, based on previous work performed in Haiti and clusters of 25, based on clinic level data from Phase 1 findings and an estimate for fixed clinics. Design effect=1+(25-1)*0.04=1.96.

sample size to detect a difference between groups. Four hundred and ninety-six women in both fixed and mobile clinics were the desired group sizes, for a total sample of 992 women.

The observation instrument consisted of 90 items for the observer to circle, “yes”, “no” or “unsure” if a service was performed, or information asked or stated. Two additional items scored in the same manner were based on the judgment of the observer based on research guidelines of provider interpersonal behavior. Outcome indices were created for each of the eight care components, summing the process indicators (0 for no and 1 for yes) for each care component and converting these to the proportion of services provided to a woman. The composition of five of the care components vary depending on the whether it was a woman’s first visit to the clinic, if it was her first pregnancy, the number of months pregnant and if she was given antibiotics (Appendix 3.7). Differences between fixed and mobile clinics for the quality of ANC for the eight care components were tested with random-effects models (xtmixed and xtmelogit in Stata) to account for clinics nested within sample clusters, with care providers included as a random effect. Four of the care components were analyzed as continuous variables. The outcome variables for the lab exam, distribution of supplies, IFA and TT, infection prevention and control and documentation were converted to dichotomous variables and analyzed using logistic regression, due to the small number of variables in the indices and therefore limited variation. All dichotomous outcomes were defined by presence of at least one of the services in that care component. We adjusted for the order of a woman observed throughout the day, the observer, if it was a woman’s first time at the clinic and the number of months pregnant in all models and , if it was her first pregnancy in the models with continuous outcomes only. We hypothesized these variables most influential to provider behavior (Appendix 3.8).

Similar to indices for process indicators, indices were also created for the immediate outcomes of women’s knowledge and perception of quality of care received based on responses during the exit

survey with care recipients. The knowledge index included seven areas of education or information that could have been provided to the woman during the consultation or in group education sessions. If a woman reported receiving education on a topic and could provide at least one correct piece of information, it was coded as "1" for the dichotomous variable and then added together to create an index. The perception of quality of care index added responses to 12 aspects of quality of care, rated by women on a scale of 1-3, 3 being the highest score (Appendix 3.9). Data analysis was performed in Stata (StataCorp, version 12.1) (46).

Results

The study obtained permission to attend all 17 fixed health centers, but only 15 had enough women who come for ANC to warrant inclusion in the study. Of these 15 health centers, four were dispensaries, eight health centers and three hospitals. All mobile clinics matched to the 17 health centers were included in the analysis, resulting in 31. Of the 1,175 women who received consultations from selected providers on the day(s) observers attended each clinic, 1,069 observations were performed and 999 of these were used in the final analysis (345 from fixed clinics and 654 were from mobile clinics) (Figure 3.1). Sixty-two percent of all women observed were asked to participate in the exit survey. Five percent of women declined to participate, leaving 585 interviews used in the final analysis (215 from fixed clinics and 370 from mobile clinics).

Characteristics of ANC Providers and Recipients

The majority of providers in fixed clinics were observed once. In the WV program, ANC providers implement multiple mobile clinics, resulting in half of the WV providers being observed two or more times (Table 3.2). There were no other significant differences in characteristics between fixed and mobile clinics for ANC providers and clinics observed.

There were no significant differences between women who were observed at fixed and mobile clinics for any characteristics (Table 3.3). Additionally, there were not statistically significant differences between the observation and exit interview samples for mean age of gestation or if it was a woman's first pregnancy, but there was a higher proportion of women in the observation sample who attended ANC for the first time compared to the interview sample (comparison not shown).

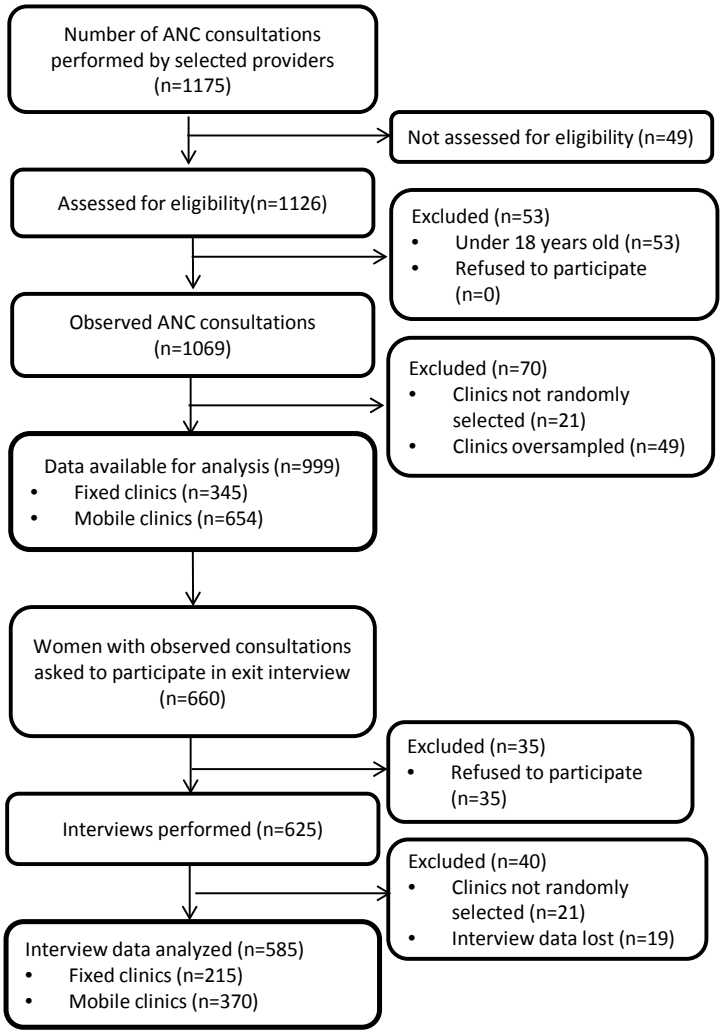

Figure 3.1 - Flow chart of observations and interviews performed and analyzed

Women who opted not to participate in the exit interviews were asked to respond to four questions, including their age, number of months pregnant, household size, and the commune (county) they live in. Thirty-four out of 35 women agreed to answer these four questions. Forty-seven percent of these women were observed at fixed clinics and 53% at mobile clinics, with no one clinic disproportionately represented (data not shown). Their mean age (28.2 y) and mean gestational age (7.2 mos) were slightly higher than those who agreed to be interviewed. The number of people residing in the household was not statistically different from those who participated in the survey.

Table 3.2 – Comparison of characteristics of antenatal care providers and clinics observed by clinic type

	Fixed Clinic Providers (n=24)	Mobile Clinic Providers (n=19)	p-value
Number of times observed[a]			
1 time	21 (88%)	9 (47%)	<.01*
>1 time	3 (13%)	10 (53%)	
Provider[a]			
Male	1 (4%)	2 (11%)	.42
Female	24 (96%)	16 (90%)	
Level of training[a]			
Doctor	1 (4%)	0 (0%)	.09
Nurse midwife	8 (33%)	1 (5%)	
Nurse	8 (33%)	8 (42%)	
Nurse assistant	7 (29%)	10 (53%)	
Mean number of ANC consultations performed per day per clinic (range)[b]	14.8 (2-37)	20.4 (3-55)	.12

*Statistically significant at p≤.05

[a] Significance testing performed using chi-squared test

[b] Significance testing performed using xtmixed adjusting for clinic nested in cluster and health care provider

Percent might not add to 100% due to rounding

Table 3.3 - Characteristics of women with observed consultations and interviews by clinic type, accounting for clustering

	Fixed Clinics	Mobile Clinics	p-value
Women observed	n=345	n=651-652	
Primigravid	21.0%	20.0%	.67
First consultation	31.4%	36.0%	.44
Mean months pregnant if first visit to clinic[a]	4.82	5.26	.06
Mean months pregnant if not first visit to clinic[b]	6.63	6.59	.83
Women interviewed	n=215	n=367-368	
Primigravid	22.6%	18.9%	.40
First consultation	34.9%	34.3%	.74
Mean months pregnant if first visit to clinic[c]	4.92	5.18	.35
Mean months pregnant if not first visit to clinic[d]	6.35	6.60	.14

*Statistically significant at p≤.05

[a] n=106 and 252 for fixed and mobile clinics respectively

[b] n=231 and 387 for fixed and mobile clinics respectively

[c] n=75 and 126 for fixed and mobile clinics respectively

[d] n=140 and 241 for fixed and mobile clinics respectively

Predicted values and significance testing performed using xtmelogit or xtmixed adjusting for clinic nested in cluster and health care provider

Process Measures

Mobile clinic consultation durations were significantly shorter than fixed clinic consultations at both first and follow-up visits. First visits lasted on average 13.0 and 7.5 minutes in fixed and mobile clinics respectively and follow-up visits lasted 10.5 and 7.5 minutes in fixed and mobile clinics (Figure 3.2).

Between 10 and 55% of recommend services were provided to women for all four care components that were analyzed as continuous outcomes, with large discrepancies between care components (Table 3.4). Fewer than one-third of all intake questions were asked of women and fewer than 13% of educational and counseling messages were provided to women in both clinic models. Between 44 and 53% of the services that are part of the physical exam and health provide communication and interpersonal delivery were performed.

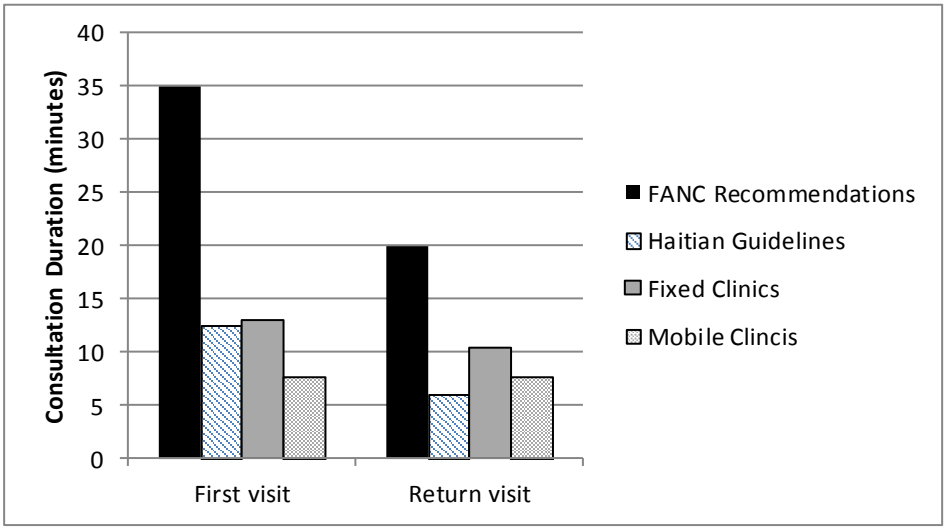

Figure 3.2 – Consultation duration recommended by FANC and Haitian guidelines compared to current practice in fixed and mobile clinics

FANC and Haitian Guidelines shown as mean of suggested range
n=105 and 247 at fixed and mobile clinics respectively for first time visits
n=225 and 376 at fixed and mobile clinics respectively for return visits

Table 3.4 – Mean proportion of total services provided to patients for care components with continuous outcomes by clinic type

	Intake	Physical exam	Educational messages and counseling	Health provider communication and interpersonal delivery
n	995	996	364	968
Fixed Clinic	.28	.53	.13	.47
Mobile Clinic	.23	.50	.10	.44

Note: Adjusted for clinic nested in cluster and health care provider

There were significant differences in the proportion of services delivered between fixed and mobile clinics for intake (in favor of fixed clinics), but not for the physical exam, educational messages and counseling and health provider communication and interpersonal delivery (Table 3.5). Further analysis in intake between clinic types revealed that the difference were driven by providers in fixed clinics consistently asking more questions, rather than asking questions in any one area neglected by mobile clinic providers. Although there were no differences between clinic models in the proportion of services provided in the physical exam component, there are certain services, such as taking of blood pressure and uterine height, that were provided consistently by providers in both clinic models and other

services, such as measuring height or checking the perineal area, that were rarely performed in either clinic model.

There was no difference in the percent of educational messages and counseling delivered; in both clinic models fewer than 13% of the total possible messages were delivered. This low percent should be interpreted cautiously. FANC recommends the majority of these educational messages be delivered during each consultation, however the Haitian guidelines do not state the desired timing. Without clear information in the Haitian guidelines, we therefore considered the percent of educational messages delivered out of all possible education topics. Additionally, not all education takes place between the primary care provider and the patient. The exit survey showed that 29% of women in fixed clinics and 68% of women in mobile clinics reported participating in a group education session, which were commonly led by community health workers or other health staff while women wait for their consultation. These group sessions were not observed.

Table 3.5 –Model results for differences between clinic types in the proportion of care components delivered for continuous outcomes

Model and variable	Intake	Physical exam	Educational messages and counseling	Health provider communication and interpersonal delivery
Unadjusted model				
n	995	994	991	973
Fixed- Mobile Difference	-.05 (.05)*	-.04 (.23)	-.03 (.17)	-.03 (.20)
Adjusted model				
n	975	976	967	949
Fixed- Mobile Difference	-.06 (<.01)*	-.05 (.09)	-.03 (.17)	-.03 (.24)
Order of women seen throughout day	<-.00 (.13)	<-.01 (<.01)*	<-.01 (<.01)*	<-.01 (<.01)*
Observer	.01 (<.01)*	.01 (<.01)*	<-.01 (.52)	<-.01 (.63)
First Visit	.05 (<.01)*	-.13 (<.01)*	.02 (<.01)*	<.01 (.83)
Primigravid	.05 (<.01)*	-.02 (.05)*	<-.01 (.94)	<-.01 (.84)
Number months pregnant	-.01 (.01)*	-.01 (<.01)*	<.01 (.02)*	<.01 (<.08)

*Statistically significant at p≤.05; All shown as coefficient (p value)
Predicted values and significance testing performed using xtmixed adjusting for clinic nested in cluster and health care provider
Models adjusted for order of a woman observed throughout the day, the observer, if it was a woman's first time at the clinic, if it was her first pregnancy and the number of months pregnant
Differences in n's due to missing data in variables used to create indices
The intra-class correlation coefficients (ICC) for at the cluster level was 1.88% for intake and <.0001 for all other outcomes.
Coding of variables shown in Appendix 3.10

The predicted probability of recommended services provided to women for the four care components analyzed as binary outcomes was below .40 for the lab exam in fixed and less than .01 in mobile clinics types and over .90 for distribution of supplements, IFA and tetanus toxoid and documentation in both clinic types (Table 3.6). The predicted probability of infection prevention and control varied greatly between clinic types, .74 in fixed clinic and .01 in mobile clinics.

Table 3.6 - Predicted probability of total services provided to patients for care components with dichotomous outcomes by clinic type

	Lab	Supplies, iron-folic acid supplements and tetanus toxoid	Infection prevention and control	Documentation
n	364	999	469	987
Fixed Clinic	.39	.91	.74	.99
Mobile Clinic	<.01	.98	.01	1.00

Note: Adjusted for clinic nested in cluster and health care provider

The adjusted odds ratios for the lab exam, supplies, IFA and TT and infection prevention and control were significantly different between fixed and mobile clinics (Table 3.7). A lab exam and infection prevention and control were more likely to take place in fixed rather than mobile clinics. At least one supply, supplement or the TT vaccine was more likely to be provided at mobile clinics. Documentation of the exam by the provider was equally as likely to take place in fixed and mobile clinics.

The World Vision mobile clinic program is not set up to provide lab exams for safety and logistical reasons, which explains the large difference between receipt of a lab exams between clinic models. In fixed clinics, blood tests for anemia, HIV and syphilis were prescribed most frequently, to 48, 46 and 42% of women, respectively. An additional 22% of women were prescribed a lab test that was unknown to the observer because it was not stated orally. Unknown exams were not included in the regression analysis.

Table 3.7 –Odds ratios for care components delivered for dichotomous outcomes by clinic type

Model and variable	Lab	Supplies, iron-folic acid supplements and tetanus toxoid	Infection prevention and control	Documentation
Unadjusted model				
n	364	999	469	987
Fixed- Mobile Difference	<.01(<.00)*	5.07(.04)*	<.01(<.01)*	2.14(.31)
Adjusted model				
n	358	996	452	964
Fixed- Mobile Difference	<.01(<.00)*	5.16(.04)*	<.01(<.01)*	.76(.88)
Order of women seen throughout day	1.01(.88)	.98(.14)	.99(.87)	.99(.82)
Observer	.78(.09)*	N/A	.96(.81)	.97(.93)
First Visit	N/A	2.27(<.01)	.69(.50)	2.51(.53)
Number months pregnant	.83(.17)	N/A	1.19(.15)	1.53(.25)

*Statistically significant at p≤.05
All shown as coefficient (p value)
Predicted probability and significance testing performed using xtmelogit adjusting for clinic nested in cluster and health care provider
Differences in n's for due to missing data in variables used to create indices and services that apply to sub-populations (see Appendix 3.7)
Models adjusted for order of a woman observed throughout the day, the observer, if it was a woman's first time at the clinic and the number of months pregnant
The intra-class correlation coefficients (ICC) for at the cluster level was .27 for supplies, IDA and TT, .20 for documentation and ≤.001 for all outcomes
Coding of variables same as Table 3.5

Although generally low in both clinic models, differences in infection prevention and control between clinic models was driven by the smaller proportion of both hand sanitization (counted only if the patient was touched by the provider) and proper disposal of medical waste in mobile clinics. There were few incidences of improper disposal (n=30 in fixed and n=6 in mobile clinics), but when it occurred was most often gloves or gauze with bodily fluid being left in a container with no top. No cases of improper needle disposal were reported.

Referral

Referrals play an essential role in the continuum of care for pregnant women and community-based mobile clinics can be an important link between communities and the health care system. Due to the small number of women referred from mobile clinics, these data were analyzed separately. Correct referral of women according to Haitian guidelines was performed based on the documentation written

on their maternal health card during the exit survey. According to Haitian guidelines, women with systolic blood pressure greater than 140 mm Hg or diastolic pressure greater than 90 mm Hg regardless of trimester, women above age 35 years and women with greater than six pregnancies should be referred to second- or third-level facilities (35). Only a fraction of women who should be referred for these conditions were, in fact, referred. Five percent of women with blood pressure above 140/90mmHg (n=21), 8% of women above age 35 (n=37) and 11% of women with six or more pregnancies (n=4) were properly referred.

Outcome Measures

Three percent of women reported receiving no education at the clinics, 48% reported receiving messages in 1-3 areas and 49% reported receiving messages in 4-7 in areas. The median number of correct education messages women could state was one in both fixed and mobile clinics. Women who reported receiving education were able to provide at least one correct response in just over half of the educational topics in both clinics (Table 3.8). There was not a significant difference between clinics for the overall percent of educational messages women reported being told nor remembered.

Table 3.8 – Knowledge and perception of quality of care results, accounting for clustering

	Knowledge index	Perception of quality of care index**
n	566	549
Fixed Clinic	.54	34.1
Mobile Clinic	.56	34.8
Fixed-Mobile difference	.02	.73
p-value	.47	.02*

*Statistically significant at p≤.05
**This index consists of 12 aspects of quality of care, rated by women on a scale of 1-3, 3 being the highest score. Thirty-six is the maximum on this index.

In both clinic models, over 90% of women could provide one correct response in two educational areas: birth preparation and the recommended duration of exclusive breastfeeding. Knowledge about

pregnancy danger signs, delivery danger signs, and the reason for a TT are moderate to low (Appendix 3.11a and 3.11b). Of note is the marked decrease in the percent of women able to provide more than one correct answer for questions about birth preparedness and emergency readiness. For two out of the three topic areas, fewer than half of the women who could provide one correct answer could provide a second correct answer when probed.

The majority of women gave high ratings for perception of quality of care for all 12 areas of care and overall scores were similar for fixed and mobile clinics. Mobile clinics were rated slightly higher overall. The two areas of care that received the lowest quality ratings were the time women had to wait and the cleanliness of the clinic, although even these were deemed acceptable by 80% of women at both clinic models. Notably highly rated by women were the treatment by the ANC provider and support staff and the cost of care[12].

Discussion

Mobile clinics are often proposed as a viable, alternative delivery model for numerous individual ANC interventions, however, there is no prior evidence about ANC quality of care in such clinics. Based on our study comparing fixed and mobile clinic quality, we conclude that the quality of care delivered in both models was poor. If women receive poor care it is less likely that the effect of increased coverage of ANC is detectable in knowledge, behavioral or health outcomes. This could potentially cause policy makers or programmers to erroneously conclude that mobile clinics and/or ANC are not a wise investment. Based on our findings, we propose similar interventions to improve quality of care in both types of delivery models.

[12] 14% of women in fixed clinics and 69% of women in mobile clinics paid for their care. The median in both clinics was 25 goudes, approximately 0.55 USD.

Process of ANC

Although we found that the quality of antenatal care differed between fixed and mobile clinics for four of the eight care components, differences in intake and supplies, IFA and TT were small and likely not clinically significant, while differences in receipt of lab exams and infection control were large and could be clinically meaningful. These four care components with significant differences between delivery models had the highest random variability by clinic, not provider, indicating that structural- or clinic-level organizational differences between models drive behaviors in these areas more than differences between providers. Referrals, an essential link between community-based care and higher level care was low for the three conditions studied, which may reflect inconsistent Ministry of Health Guidelines for referral.

A potential reason for the low adherence to the Haitian guidelines in both clinic models is the short duration of consultations, which is likely caused by the high volume of women in some clinics and large range of numbers of women who seek ANC: 2-37 per day in fixed clinics and 3-55 per day in mobile clinics. Additionally, some providers may have performed other types of consultations in addition to ANC consultations, such as post-natal or well-baby visits) but these were not included in our study. Fixed clinic consultations lasted on average five and three minutes longer for first and follow-up visits, respectively, than those in mobile clinics. However, it is not evident how this additional time was spent. Women received a slightly higher proportion of the intake questions and lab exams (usually performed in a lab, not the provider) but did not receive more time-consuming services, such as the physical exam or education and counseling. Possibly providers spent more time on counseling but, if so, the effect of this was not seen in women's knowledge. Short duration of consultations has been shown to limit adherence to ANC guidelines in other countries and likely prevents providers from making correct diagnoses and management plans (27).

Two general trends emerged when we compared our study to other studies that assessed ANC process measures. The first trend is selective adherence to clinical guidelines (47). In our study and others, providers "pick and choose" services, providing some basic services to a high proportion of women and performing other services infrequently (47-49). For example, across studies, taking of blood pressure, measuring uterine height and listening to the fetal heart rate are much more commonly performed in the physical exam than checking for edema or weighing patients (47-49). This indicates that providers offer their version of "routine" care, which is incomplete according to clinical guidelines, and furthermore that care is not individualized. The second trend is that ANC providers perform better when measured against guidelines for the physical exam and health provider communication and interpersonal delivery components than against guidelines for education and counseling and intake. The reasons for this consistency across settings are unknown, but likely include institutional culture, training, available resources, use of informal guidelines, such as the ANC card and the lack of a "counseling culture" in many medical settings (12, 27, 49-51). Not surprisingly, performance in distribution of supplies, IFA and TT and the lab exam are highly dependent by site, according to availability (12, 47-49, 51, 52).

Outcomes of ANC

We found that the amount of information women retained from education and counseling received from the two clinic models was remarkably low and there were no differences between them. Women perceived a high level of quality in both clinic models, which was slightly higher at the mobile clinics, driven mostly by slightly higher scores for cleanliness and availability of medicine or supplements.

Almost all women reported receiving educational messages during their ANC visits, either in group sessions or from the provider, but the effectiveness of education appears low even when a very low criterion is applied (i.e., women were able to state at least one correct response in about half of the

educational topics in which they report receiving education). Group education sessions, most commonly performed while women waited for their consultation, appear to be where women received the most education, but these were not observed in our study. Nonetheless, had this group education been effective, mothers would have reported the knowledge in our survey. Other studies have also documented low levels of education, counseling and knowledge in essential areas of birth preparedness and emergency readiness, indicating that this is a wide-spread problem of ANC programs (12, 49, 51).

Even with a low to moderate percent of clinical services being provided and poor education effectiveness, recipients of care perceived that they received high-quality care in both clinic types, which is slightly higher in mobile clinics. This paradox has been seen in other health contexts, where provider respect and politeness are deemed more important to patients than technical measures of care (53). In this study, providers were consistently seen as treating patients politely and with respect, which likely mediated women's perceived quality of care (54, 55). Additionally, low consultation cost has been shown to increase patients' perceptions of care quality in other developing countries (56).

Given the low proportion of services provided to women in each of the care components and women's knowledge about topics learned at ANC visits, it is unlikely that ANC as currently delivered in either fixed or mobile clinics is meeting its objectives. Our finding that ANC quality in mobile clinics is similar to that of fixed clinics for the majority of outcomes studied implies that the means to improve quality of care in both types of clinics should be comparable in most care components. The good news is that there is increasing evidence about improving provider performance in developing countries and these have been shown to be moderately effective, especially when multiple strategies are implemented to address specific barriers at both individual and institutional levels (51, 57). These could include educational interventions, supervision, audit and feedback and job aids (58).

Mobile clinics, depending on the context, may be limited by their structure and therefore in their ability to perform laboratory exams. Although this is a potential limitation of the model, it does not negate its other potential benefits. Partnerships between mobile and fixed clinics can be forged to increase availability of lab services at mobile clinics. Such partnerships took place in some mobile clinics, but could be expanded. Additionally, communication between fixed and mobile clinic providers needs to be strengthened to improve the continuum of care between clinics. This would require a commitment to documentation and adaptation of forms accepted across institutions, seemingly possible given the high levels of documentation.

Validity of the data

It is possible that by performing direct observations, our study altered provider and the patient behavior in our study. Women may not have been as comfortable as they might have been otherwise to mention sensitive topics or raise questions, although this would not have affected our outcomes. It is commonly assumed that observed health care providers are on their "best behavior" and perform better than they would otherwise. It is also possible that providers are unable to change their practice habits and quickly grow accustomed to being observed, minimizing this effect, especially if they do not know the study objective (20). The direction of the observation effect in our study is not known and is likely to vary by provider. We attempted to minimize any observer effect in the study design and it was assessed in the two ways in the analysis. First, observers spent at least a full day with care providers in an attempt to ease providers and provide enough time for providers to resume their normal activities. Neither the purpose of the study nor study instruments were shared with them. A study in Tanzania found that quality of care increased with an observer present, but decreased by the 10-15th patient (59). It is not known if this drop was due to normal fatigue seen throughout the day or due to becoming accustomed to being observed. Whatever the cause, we controlled for the order patients were seen each day,

limiting potential bias. Second, we explored the possibility that providers observed more than once might become used to being observed, resulting in a qualitative difference between being observed the first or future days. We included a dummy variable (one vs two or more days observed), which was not significant for any outcome. Given these results, and no reason to suspect a differential observation effect between fixed and mobile clinics, we believe that an observation effect did not substantially affect our conclusions.

Because there were four observers at the peak of the study, it is possible that there was inter-observer variation. We attempted to reduce any potential variation by including an intensive hands-on training and performing field supervisions, which showed high agreement with the head researcher and kappa statistics. Even so, when including observer as a fixed effect in our mixed models, the observer was significant in four models – intake, the physical exam, the lab exam and supplies, IFA and TT. Significance in these models is likely because observers were not randomly assigned to health care providers for logistical reasons, resulting in certain observers and care providers being paired more often than others.

Finally, it is possible that respondents in the exit survey were influenced by courtesy bias, compelling them to inflate their responses of perception quality of care. We attempted to minimize this effect by asking a mix of objective and subjective questions, as objective questions have been shown to be more comparable to results from community-based surveys of health care quality (56). We found no statistically significant difference in responses between these two types of questions.

Conclusion

In this study we identified important gaps in ANC quality and potential reasons for these gaps in both fixed and mobile clinics. We found that quality of ANC delivered through mobile clinics suffers from similar problems as traditional fixed clinics in central Haiti, indicating that the ANC system in Haiti is

weak and solutions to ameliorate these problems should be similar. With coverage of ANC increasing in developing countries, and the potential of mobile clinics to increase coverage even further, improvements in quality of care will be essential to achieve improved maternal and perinatal health. The direct observations and exit surveys used in this study provided us with actionable information and could be used to design interventions to improve quality of care.

In addition, our experience in this study suggests that performing direct observations is practical for assessing the breadth of services performed during ANC consultations. This method met our objective to compare the quality of care between fixed and mobile clinics and we believe this method and the study instruments can be used in other program settings at a reasonable cost.

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APPENDICES

Appendix 3.1 - Rubric for assessment of ANC

	Structure	Process	Outcomes
History taking/ review of history and changes	Availability of: • WV ANC cards (where applicable) • Haiti national ANC cards Staff training in history taking	Assessment: • Provider asks about select essential health and obstetric history and changes throughout pregnancy (Previous stillbirth or neonatal loss, diagnosed with hypertension, eclampsia or pre-eclampsia at during last pregnancy, previous surgery to reproductive tract, suspected multiple pregnancy, age <16 or >40, hemorrhage) Classification: • Woman correctly classified if needs referral/special care Treatment: • Woman correctly informed if needs referral/special care Advice and counseling: • Provider informs woman of need to seek referral/special care	Immediate: • Woman understands need for referral/special care Intermediate: • Woman seeks care at higher level facility as advised Final: • Reduction of adverse effects from poor history taking and lack of ability to act
Physical exam	Tools - Availability of: • Sphygmomanometer • Adult and fetal stethoscope • Tape measure • HemoCue photometer/ automatic cell counter Staff training in physical exam protocols Staff education level	Assessment: • Blood pressure measurement • Fundal height measurement • Weight (visit 1 only) • Height (visit 1 only) • Gynecological exam (visit 1 only) • Breast exam (visit 3 only) • Detection of breach birth (month 9) • Chest and heart auscultation • Check for severe anemia (visits 1,2) • Check for fetal heart sounds (visits 3, 4) Treatment: • Correctly treated based on assessment and classification Advice and counseling: • Correct advice administered Not performing a procedure that is known to be harmful to a woman or her child	Immediate: • Woman satisfied with administration of physical exam services • Woman satisfied with range and type of physical exam services • Woman understands purpose and outcome of portions of physical exam Intermediate: • Woman takes appropriate steps to managing complication Final: • Desired health outcomes for women and fetus/newborn, such as reduced anemia, treatment for STIs or infections, PMTCT

Laboratory exam	Supplies available: • Gloves, alcohol, cotton • Sample containers for collection of materials (blood and urine) • HemoCue related supplies • Urine Sticks • RPR/VDLR for Syphilis • HIV • Blood group and Rh factor Staff training in lab protocols Means of requesting/accessing necessary supplies	Assessment: • Urine for bacteriuria (visits 1, 2, 3) • Urine for proteinuria (1st visit) • Rapid Syphilis test (1st visit) • HIV test (1st visit) • Hb test (3rd visit) • Blood typing Treatment: • Correctly treated based on assessment and classification Advice and counseling: • Correct advice administered	Immediate: • Woman is satisfied with type and range of lab services • Woman satisfied with administration of lab services • Woman understands lab results and treatments received Intermediate: • Woman takes appropriate actions based on advice and counseling Final: • Reduction of adverse effects caused by bacterial infection, pre-eclampsia, syphilis, and severe anemia
Drugs/ immunization	Availability, viability and proper dosage of: • IFA(60 mg/400mcg) • Penicillin (for syphilis) • Antibiotics/ for urinary tract infections and other STIs, • Tetanus toxoid vaccine (.5mL) • Vitamin A (25,000IU weekly) • Calcium (1.5-2g daily) • Iodine (400mg/year) Staff training in drugs/immunization Means of requesting/accessing necessary supplies	Drugs and immunizations given/prescribed in proper amount: • IFA • Penicillin • Antibiotics/ for urinary tract infections and other STIs, • Tetanus toxoid vaccine (1st visit and at least 4 weeks later visit unless known fully vaccinated) • Vitamin A • Calcium • Iodine	Immediate: • Woman satisfied with type and range of drugs/immunizations given to her • Woman satisfied with administration of drugs/immunization • Woman understands why drugs/immunizations given to her Intermediate: • Woman adheres to prescribed regimen for drugs Final: • Reduction of adverse effects caused by anemia, syphilis, UTI, STIs, tetanus, and vitamin A, calcium and iodine deficiencies
Infection prevention	Available supplies • Gloves • Hand sanitizer • Soap and water • Proper disposal of biohazard Training on infection prevention Training general safety measures Transport/ final location of disposal Means of requesting/accessing necessary supplies	• Hand washing/hand sanitation between patients • Equipment sanitation between patients • Proper use of supplies for individual consultation (is new gloves, needles, wiping off of thermometer, etc) • Proper disposal of used supplies (gloves, lancets, cuvettes)	Immediate: • Woman's satisfaction with cleanliness of waiting area • Women's satisfaction with cleanliness of exam area • Women's satisfaction with provider's actions to prevent infection Final: • Reduction/elimination of infection due to poor implementation of consultation

Health education/ counseling	• Availability of visual aids • Existing curriculum • Staff training on health education	• Advise on birth plan • Advise on recognition of danger signs • Advise on emergency preparedness • Advise on exclusive breastfeeding • Advise on nutrition/healthy lifestyle	Immediate: • Maternal comprehension of health education and counseling messages Intermediate: • Mother acts on advise Final: • Reduction in adverse effects caused by lack of birth readiness and emergency preparedness
Documentation	Availability of: • WV ANC cards (where applicable) • Haiti national ANC cards • Staff training in documentation	• Provider uses ANC card to document information • ANC cards filled out entirely • Content of information accurate	Intermediate: • Facilitation of communication between ANC providers, between levels of care, for consecutive pregnancies Final: • Reduction of duplicative or delay in care due to poor documentation
Interpersonal skills	• Staff training in counseling and communication	• Provider Invites questions from woman • Providers responds to questions and provides advice in a respectful way for each patient • Provision of timely, appropriate counseling messages • Polite/non abusive manner in consultation	Immediate: • Woman's satisfaction with provider's interpersonal skills Intermediate: • Woman more likely to respond to information and advice based on delivery by provider Final: • Improved outcomes based on style of delivery
Administration/ Organization	ANC provider/patient ratio Privacy of exam area	• Woman told appropriate time to come back • Time woman waited to see provider • Time spent with provider • Women turned away without receiving care • Treatment by support staff	Immediate: • Woman's satisfaction with provider's time waited to see provider • Woman's satisfaction with time spent with provider • Woman's satisfaction with treatment by support staff Intermediate: • Woman more likely to respond to information and advice based on delivery by provider Final: • Improved outcomes based on style of delivery

Adapted from Donabedian 1988, Maxwell, 1992, WHO, 2001, WHO, 2004, Haitian MOH, 2010

Appendix 3.2 – Observation Instrument, English version

Cornell University and World Vision

Antenatal Care Study

Observation form for antenatal care

1. Facility and Provider Identification

No	Question	Response
101	Date	Date: _____ Month:_____
102	Name of health facility	_____
103	Location of the facility/clinic:	_____
104	Observer code	Jacqueline Baptiste……3 Cyntia Michel……8 Marie Nadeige Myrtil……9 Erica Phillips……10 _____
105	Provider Category	OB/GYN……..1 General doctor……..2 Nurse……3 Midwife……..4 Nurse auxiliary……..5 Other _____
106	Sex of provider	Male…….1 Female….2
107	Provider code (for observer to fill in)	_____
108	Client code (place number from sticky pad on mother's card, vaccination card or hand to woman)	_____

109	Does the woman agree to participate?	Yes……..1 if yes, you can start the observation No…….2 if no, stop the observation
110	Is this woman 18 years old?	Yes……..1 if yes, you can start the observation No…….2 if no, stop the observation

2. Observation of Antenatal-Care Consultation

201	RECORD THE TIME THE OBSERVATION STARTED	_____:_____

No	**Question**	**Response**
What is the status of the patient(the observer has to complete this part. If you don't know, ask the provider		**YES NO DON'T KNOW**
202	Is this the client's first visit at this facility/clinic for this pregnancy?	1 0 99
203	Is this the client's first pregnancy?	1 0 99
204	How many months is the patient pregnant	_____months _____ weeks The provider does not know/does not say……98 Don't know……..99

	Did the provider ask or did the patient mention one of the following aspects about the client's previous pregnancy **(If it is first time pregnant, skip to 210. Leave 205-209 empty)**	**YES NO DON'T KNOW**
205	Prior stillbirth(s)	1 0 99
206	Infant(s) who died in the first week of life	1 0 99
207	Heavy bleeding during or after delivery	1 0 99
208	Previous assisted delivery (Cesarian section, ventouse or forceps)	1 0 99
209	Previous spontaneous abortions	1 0 99
	Did the provider ask or the client mention any of the following aspects?	**YES NO DON'T KNOW**
210	Patient age	1 0 99
211	Medications client is taking	1 0 99
212	Number of prior pregnancies client has had	1 0 99
213	Date/month client's last menstrual period began	1 0 99
214	What is the date the woman mentions? Please write exactly what she says	Month_____date_____ Other_____97 The woman does not know……98 Don't know……99
215	What date/month does the provider give the woman for her due date?	Month_____date_____ Other_____97 The nurse does not say……..98 Don't know……99
	Did the provider ask or the client mention any of the following aspects of the client's current pregnancy?	
216	Bleeding	1 0 99
217	Fever	1 0 99
218	Headaches or blurred vision	1 0 99

219	Swollen face or hands	1	0	99
220	Tiredness or breathlessness	1	0	99
221	Whether the client has felt the baby move	1	0	99
222	Whether there are other symptoms or problems the client thinks might be related to this pregnancy	1	0	99

	Did the provider perform the following procedures?	YES	NO	D/K
223	Take the client's blood pressure	1	0	99
224	Did the provider take the client's blood pressure more than one time?	1	0	99
225	Weigh the client	1	0	99
226	Take the client's height	1	0	99
227	Take the client's temperature	1	0	99
228	Examine conjunctiva/palms	1	0	99
229	Examine legs/feet/hands for edema	1	0	99
230	Palpate the client's abdomen for fetal presentation (or conduct ultrasound)	1	0	99
231	Palpate the client's abdomen for fundal height (or conduct ultrasound)	1	0	99
232	Listen to the client's abdomen for fetal heartbeat with a fetoscope or fetal monitor	1	0	99
233	Examine the client's breasts	1	0	99
234	Conduct vaginal exam/exam of the perineal area	1	0	99
235	Perform or refer (in same institution) for anemia test	1	0	99
236	Provide or refer (in same institution) for blood typing	1	0	99
237	Perform or refer (in same institution) for syphilis test	1	0	99
238	Perform or refer(in same institution) for malaria test	1	0	99
239	Perform or refer(in same institution) for sickling test	1	0	99
240	Perform or refer (in same institution) for HIV test	1	0	99
241	Provide or refer (in same institution) for counseling related to HIV test	1	0	99
242	Perform or refer (in same institution) for urine test for protein	1	0	99
243	Perform or refer (in same institution) for urine test for bacteria	1	0	99
244	Provide or refer (in same institution) for counseling related to an unspecified lab exam	1	0	99
245	Recommend to go to another institution for any lab tests/exams	1	0	99

	Did the provider perform any of the following or make sure that the woman knows them:	**YES**	**NO**	**DON'T KNOW**
246	Prescribe or give iron or iron folic acid pills	1	0	99
247	Explain the purpose/benefit of iron or iron folic acid (for prevention or treatment of anemia/they give blood or energy/they protect health of the woman or her baby)	1	0	99
248	Explain how to take iron or iron folic acid (normally 1 pill per day)	1	0	99
249	Explain side effects of iron pills (could be vomiting, diarrhea, constipation, black stools, nausea or GI discomfort)	1	0	99
250	Describe foods that are high in iron? (meat, leaves, fish, beans, bean sauce, spinach. NOT carrots, other vegetables, bananas or plantains)	1	0	99
251	Prescribe or give antibiotics	1	0	99 Specify type _____
252	If given antibiotics, was reason given to client why antibiotics given?	1	0	99
253	If given antibiotics, were instructions, including how often and how long to consume antibiotics provided?	1	0	99
254	Prescribed or given multivitamin	1	0	99
255	Prescribed or given any other pills or supplements	1	0	99 Specify type _____
256	Prescribe (in the same institution/program/rally post)or give tetanus toxoid (TT) injection	1	0	99
257	Explain the purpose of a tetanus toxoid (TT) injection	1	0	99
258	Importance of mosquito net (ITN) explained explicitly	1	0	99
259	Client given ITN free of charge	1	0	99
260	Client purchased ITN from provider	1	0	99
	Did the provider mention the following signs and symptoms as risk factors for which the woman should return to the facility (or confirm that the woman knows these signs):	**YES**	**NO**	**DON'T KNOW**
261	Vaginal bleeding	1	0	99
262	Fever	1	0	99
263	Excessive tiredness or breathlessness	1	0	99
264	Swollen hands and face	1	0	99
265	Severe headache or blurred vision	1	0	99

	Did the provider advise or counsel the women about the following topics:	YES	NO	DON'T KNOW
266	Ask the client where she will deliver	1	0	99
267	Client indicated that she plans to deliver in a facility	1	0	99
268	Advise the client to use a skilled health worker during delivery (Doctor, nurse or midwife, but not a TBA)	1	0	99
269	Discuss with client what items to have on hand at home for delivery, such as razor, string, cotton, gloves, a sheet	1	0	99
270	Provide the client with a birth kit (containing at minimum a razor, cotton, gauze, string and a sheet)	1	0	99
271	Mention planning for transportation during labor (either to place of delivery or for emergency care during home delivery)	1	0	99
272	Mention setting aside money for emergencies at the time of delivery	1	0	99
273	Discussed importance of having at least 3 prenatal visits	1	0	99
274	The quality or quantity of food to eat during pregnancy, other than foods with iron	1	0	99
275	Advised the mother to exclusively breastfeed for up to 6 months	1	0	99
276	Discussed importance of immunization for the newborn	1	0	99
277	Discussed importance of a post-partum visit for the baby	1	0	99
278	Discussed importance of a post-partum visit for the mother	1	0	99
279	Discuss family planning for use after delivery	1	0	99
	Record the way the provider interacted with the patient.	**YES**	**NO**	**DON'T KNOW**
280	Did the provider ask whether the client had any questions?	1	0	99
281	Inform the client about the progress of the pregnancy	1	0	99
282	Did the provider speak to the client/answer questions that could be understood by the client?	1	0	99
283	Did the provider speak politely to the client?	1	0	99
284	Did the provider explain the reason that she performed any of the services she performed?	1	0	99
285	Did the provider use her cell phone during the consultation with the client?	1	0	99

286	Look at client's health card (either beginning the consultation or while collecting information or examining the client)	1 0 99
287	Did the provider use any visual aids for health education or counseling during the consultation?	1 0 99
288	Did the provider write on the client's health card (retained by the woman)?	1 0 99
289	Did the provider write on the client's facility/clinic card (retained by the facility)?	1 0 99
290	Did the provider use a chart that indicates the weight and the evolution of the pregnancy?	1 0 99
291	Did provider wash hands/disinfect hands/change gloves before touching this client?	1 0 99
292	Did provider correctly dispose of all medical waste from this client? (Needles in a plastic or a cart box, gas, liquid in a recipient that has a cover, any gauze with bodily fluid in a container with a lid)	1 0 99(not applicable)
293	RECORD THE OUTCOME OF THE CONSULTATION WHEN THE OBSERVATION IS ENDED	**The client has not been referred/has been sent home……..1** **The patient has been referred to someone else to be seen or to have a lab test at this same facility……2** **The patient is hospitalized in this same facility……..3** **The patient has been referred to another facility……4** **Don't know……99**
294	Did provider ask the woman to come back for future appointment?	1 0 99
295	If yes, record the time of this appointment	Date _____Months_____ Other_____97 Doesn't say……98 Don't know……..99

296	If the client was referred, what was the reason told to the client by the provider?	_____ _____ _____ Does not say……98 Don't know……99

297	RECORD TIME THE OBSERVATION ENDED	_____:____

300	Observer's comments

Appendix 3.3 – Care Provider Observation Oral Consent Form, 2012

Instructions for observer: Please read/say contents of this oral consent form to the care provider you would like to observe before the start of antenatal care observations for the day. You only need to perform this consent form once, even if you perform observations multiple days. Please remember that the care provider can refuse to participate at any time. Do not badger or try to convince them to participate if they do not want to.

Good morning/afternoon, my name is _____ and I am working on a research study sponsored by World Vision and Cornell University about antenatal care in Haiti. I would like to ask you to participate in this research study. If you are willing to listen, I will describe this study to you, answer any of your questions and you can let me know if you agree to participate.

The purpose of this study is to assess the antenatal care provided to women in different parts of Haiti to understand what works well and where improvements can be made. As part of this study, we are observing the antenatal care consultations of women at many different health clinics.

If you agree to participate in this study, I would like to observe the care you provide to pregnant women who come to this clinic today and possibly tomorrow as well. I will stand in the room/area where the consultation takes place, but will position myself in a way that will respect the woman's personal privacy. During this observation, I will not speak to you or to the patient, but will observe and take notes about the care provided. These notes will not evaluate you personally or be about the health status of the woman, but about the interaction between you and the woman. We will not record the interaction except to write down notes. These notes will be held strictly confidential.

I do not anticipate any risks to you from participating in this study. Please be assured that whether or not you participate in this study, it will not affect your employment at this health clinic, now or anytime in the future. Should you accept to participate, you may change your mind at any time during the observations without any negative consequences from me or your employer. Again, your participation is voluntary. Any information we write down or observe will not be shared with anyone at this clinic such as your supervisor or anyone within the organization that you work for nor any of the women who seek care at this clinic. All information will be held confidential. I will not ask your name and your name will not appear on the form nor any reports that are written about this research. I will closely guard the observation form once it is filled in to make sure no one else can read it.

There is no payment for taking part in the study.

Do you understand what I have explained to you? Do you have any questions that you would like to ask before making a decision about your participation?

In case you have any questions or concerns about this study later, you may direct them to Dr. Lesly Michaud in the World Vision office in Port-au-Prince. (Exact address is 9 Impasse Hardy, Juvenat, Route du Canape Vert, Telephone is 509 2257-0956)

Now that I have explained the purpose of the study and some of what it will mean for you to participate, would you like to participate in this study?

Appendix 3.4 – Exit survey instrument, English version

Cornell and World Vision

Antenatal Care Study

Interview form for recipients of antenatal care

1. Facility and client information

No	Variable Name	Question	Response	Skip
101	Date	Date	Date: _____ Month:_____	
102	Fac_Name	Name of health facility/clinic	_____	
103	Fac_Loc	Location of the facility/clinic:	_____	
104	Int_Code	Enumerator code	Florence Guerisma……1 Ysmaelite Vilfort……2 Jacqueline Baptiste……3 Guirlaine Latour……4 Sabine Occean……5 Chilene Dorcely……6	
105	Client_Code	Client code	_____	
106	Wait	Did the woman have to wait to be interviewed today?	Yes….1 No…..0	
107	IRB	Does the woman agree to participate in this interview?	Yes……1 No… ……2	→Yes, continue →No, stop the interview
108	IRB_Card	Does the woman agree for you to look at her antenatal card or her vaccination card	Yes……..1 No……0 No mother's card or vaccination card…2	→Ask all of section 2 →Do not ask 205-212 →Do not ask 205-212

2. Information recorded on Maternal Health Card

No.	Variable Name	Question	Response
201	Start_Time	RECORD THE TIME THE INTERVIEW STARTED	____:_____

No.	Variable Name	Question	Response	Skip
202	Age	How old are you?	_____ years Don't know……98 Skip……...99	**→If under 18 years old, end interview**
203	First_Vis	Is today your first visit to this clinic?	Yes……1 No……0 Skip……99	**→205** **→204** **→205**
204	Clinic_Freq	How many times have you been to this clinic for prenatal care?	_____times Don't know…….98 Skip……....99	
205	ANC_Card	Do you have the antenatal care card or immunization card with you today? IF YES, ASK "Can I please see your card? I will not record any personal information like your name, but would like to look at the care you have received today"	Yes, ANC card……1 Only has immunization card……2 Has both ANC card and immunization card…….3 Does not have either card……4 Refused to show card……5	**→206** **→212** **→206** **→ End section** **→ End section**
206	Card_Vis_1	CHECK THE MATERNAL HEALTH CARD FOR THE DATE OF THE FIRST CONSULTATION FOR THIS PREGNANCY	Month_____ Date____ Year_____ Not marked on card....98 Skip……99	
207	Card_Cons_Freq	CHECK MATERNAL HEALTH CARD FOR THE NUMBER OF TIMES THE WOMAN HAS RECEIVED A CONSULTATION	_____Times Not marked on card…98 Skip……...99	
208	Card_GA	HOW MANY MONTHS PREGNANT IS THE CLIENT ACCORDING TO THE MATERNAL HEALTH CARD? (Written on card as "month of pregnancy")	_____ Months Not marked on card…98 Skip……99	
209	Card_Risk	IS THERE A COMMENT FOR "RISK" NOTED ON THE MATERNAL HEALTH CARD TODAY?	Written "Yes"……...1 Written "No"……0 Other_____97 Not marked on card…....98 Skip……99	
210	Card_Remark	IS THERE A COMMENT FOR REMARKS NOTED ON THE MATERNAL HEALTH CARD?	Please write exactly what is written on the card _____ Not marked on card……98 Skip……99	
211	Card_BP	CHECK MATERNAL HEALTH CARD FOR THE BLOOD PRESSURE READING	____/____ Not marked on card……98 Skip……99	
212	Card_TT	CHECK MATERNAL HEALTH CARD OR IMMUNIZATION CARD FOR RECORD OF THE CLIENT HAVING RECEIVED TETANUS TOXOID	Yes, 1 time……1 Yes, 2-4 times……...2 Yes, 5 or more times…….....3 Cards inconsistent……4 No…….....0 Not marked on card…98 Skip……99	

3. Information about visit and counseling/education

Now I am going to ask you some questions about your experience at this health center/mobile clinic today. Please provide honest answers.				
No.	**Variable Name**	**Question**	**Response**	**Skip**
301	Rec_IFA	During today's visit did the provider give you iron pills, sell you iron pills, or give you a prescription for them?	Yes, given……...1 Yes, sold……..2 Yes, prescribed……3 No……0 Don't know/remember…….98 Skip……..99	→303 →303 →303 →302 →305 →305
302	Ref_IFA	During today's visit did the provider give you iron pills, sell you iron pills or give you a prescription for them and you decided to not accept them?	Yes……1 No……0 Don't know/don't remember….98 Skip……99	→305 →305 →305 →305
303	IFA_Obs	ASK TO SEE THE CLIENT'S IRON OR IRON FOLIC ACID PILLS OR PRESCRIPTION COUNT THE NUMBER OF PILLS RECEIVED	_____pills Saw prescription.....96 Refusal to show pills/does not have in possession……97 Did not receive pills or prescription……..98	
304	Pay_IFA	How much did you pay for these iron pills today?	_____Gourdes They were free……..0 General payment covers IFA..97 Don't know……98 Skip……99	
305	IFA_SE	During this or previous visits **at this facility/clinic or its related activities** such as mothers clubs or rally posts, has a provider or community health worker (CHW) discussed with you the side effects of the iron pill?	Yes, this visit……..…..1 Yes, previous visit……..…2 No……...0 Don't know/rememb.er…….98 Skip……..99	→306 →306 →307 →307 →307
306	IFA_SE_Ex	Please tell me any side effects of the iron pill that you know of PROBE TO MAKE SURE WOMEN HAS STATED ALL SIDE EFFECTS SHE KNOWS OF	Nausea……..1 Black stools…..2 Constipation……..…….3 Vomiting……4 Other _____97 DK……..98 Skip……99	
307	Own_ITN	Do you own an insecticide treated bed net (ITN)?	Yes……...1 No……..…0 Skip……..99	→308 →309 →309
308	Use_ITN	Did you sleep under this insecticide treated bed net last night?	Yes……...1 No……..…0 Skip……..99	
309	Rec_TT	Have you ever received an injection during your pregnancy or previous pregnancy?	Yes, 1 time……..…1 Yes, 2-4 times……..…2 Yes, 5 times……...…3 No……..…0 Don't know……98 Skip……...99	→310 →310 →310 →312 →312 →312
310	TT_Not Rec	Have you ever received a shot during pregnancy that was not recorded on your "Maternal Health Card"?	Yes……..…1 No……0 Don't know……98 Skip……..99	
311	TT_Why	Do you know what this injection was for?	Tetanus toxoid……1 For disease/infection….2 Other response……97	

			Don't know/ don't remember……98 Skip……..99	
312	Couns_ Deliv	During this visit or previous visits **at this facility/clinic or its related activities** such as mothers clubs or rally posts, has a provider or community health worker (CHW) discussed things you should have in preparation for your delivery? This may include planning in case of emergency, things you should bring to a facility, or things you should prepare at home for home delivery	Yes……1 No……..0 Don't know…….98 Skip……99	**→313** **→316** **→316** **→316**
313	Deliv_Ex	Can you tell me anything you will need in preparation for your delivery	Emergency transport……1 Money……2 Disinfectant……3 String to cut cord……..4 Gloves……5 Cotton……6 Clothes……7 Food for mother……..8 Other_____97 DK/Don't remember…….98 Skip……99	
314	Comp_E x	What is a danger sign during pregnancy? CIRCLE ALL THE RESPONSES THAT ARE GIVEN. YOU CAN CIRCLE MORE THAN ONE RESPONSE	Hemorrhage……1 Fever……2 Hands/face have edema……3 Headache/dizziness……..4 Convulsion……..5 Baby doesn't move or movements reduced……..6 Large discharge……..7 Other sign_____97 DK/Don't remember……..98 Skip……99	
315	Deliv_D S_Ex	Do you know of any danger signs during or after delivery? CIRCLE ALL THE RESPONSES THAT ARE GIVEN. YOU CAN CIRCLE MORE THAN ONE RESPONSE	Bleeding/hemorrhage…..1 Fever……...2 Genital injuries……..3 Other_____97 Don't know/remember……98 Skip…….... 99	
316	Num_Co ns	How many visits should a pregnant woman make during her pregnancy?	_____visits Other_____97 Don't know……..98 Skip……..99	
317	Couns_ EBF	During this visit or previous visits **at this facility/clinic or its related activities** such as mothers clubs or rally posts, has a provider or community health worker (CHW) given you advice on the importance of exclusive breastfeeding – that is, about giving your baby nothing apart from breast milk?	Yes, this visit……..1 No……...0 Don't know/remember.98 Skip…..……...99	**→318** **→319** **→319** **→319**
318	EBF_Mo s	For how many months did the provider recommend that you exclusively breastfeed, that is, that you do not give your baby liquid or food in addition to your breast milk?	_____ Months Don't know/don't remember……...98 Skip…….. 99	
319	Loc_Deli v	Have you decided where you will go for the delivery of your baby?	In a health center……..1 In a hospital……2 In a private house……3 No, haven't decided ……4 Other._____97 Skip……..99	

320	Couns_ FP	During this visit or previous visits **at this facility or clinic or its related activities** such as mothers clubs or rally posts, has a provider or community health worker (CHW) talked with you about using family planning after the birth of your baby?	Yes……..1 No……...0 Don't know/remember.98 Skip…..……..99	
321	Couns_ PP	During this visit or previous visits **at this facility/clinic or its related activities** such as mothers clubs or rally posts, has a provider or community health worker (CHW) talked with you about seeking care for you or your baby soon after you give birth?	Yes……..1 No……...0 Don't know/remember.98 Skip…..……...99	
322	Couns_ RD	Did a health worker you who performed the consultation today give you an appointment for your next prenatal check-up? If yes, when is that appointment?	1 month from now……..1 2 months from now……..2 3 months from now……..3 4 or more months from now...4 No……...0 Other_____97 Don't know/remember……98 Skip…..……...99	
323	Rec_BT	During this visit or previous visits **at this facility/clinic or its related activities** such as mothers clubs or rally posts, have you received a blood test during this pregnancy?	Yes, this visit……..1 No……...0 Don't know/remember.98 Skip…..……...99	**→324** **→326** **→326** **→326**
324	Why_BT	If yes, do you know what this blood test was for? CIRCLE ALL THE ANSWERS THAT ARE GIVEN WITHOUT MENTIONING THE ANSWERS THAT ARE WRITTEN ON.. THE RIGHT SIDE. YOU CAN CIRCLE MORE THAN ONE ANSWER	HIV/AIDS……..…1 Syphilis……...2 Blood type…….....3 Sickle cell anemia..……...4 Malaria……5 Other_____97 Don't know/remember……98 Skip……...99	
325	Res_BT	You do not have to tell us the results of this test., but do you know what the results of this blood test are?	Yes……1 No……0 Skip…….……99	
326	Ed_Sess	Did you participate in an education session today?	Yes……1 No……0 Skip…….……99	**→327** **→328** **→328**
327	Ed_Topic	What was the topic of the educational session today?	The importance of prenatal care……1 Vaccines for pregnant women……..2 IFA/Anemia…..……...3 General nutrition..……4 Preparation for the birth…....5 Pregnancy danger signs…….6 Birthing danger signs…….....7 Exclusive breastfeeding……8 Cholera prevention/treatment..9 Other_____97 Don't know/remember……98 Skip……..99	
328	No_MC	IF AT A MOBLIE CLINIC: If this program is no longer here in the future, will you seek prenatal care at another location?	Yes……..1 No……0 Not at a mobile clinic……2 Don't know/undecided……98 Skip……99	**→329** **→End Section** **→End Section** **→End Section** **→End Section**

329	Care_N0_MC	Where will you seek care?	Health center/Dispensary……...1 Hospital……2 Midwife (trained or untrained)……3 Traditional healer……..4 Unsure/undecided……...5 Other_____97 Skip……99	

4. Information about client perception of quality and satisfaction

Now I am going to ask about some common problems clients have at health facilities/mobile clinics. As I mention each one, please tell me whether any of these were problems for you today, and if so, whether they were large or small problems for you. This information will help us improve services and as I said earlier this study is completely confidential. We will not share your answers with anyone else.

Interviewer: Ask each question in the exact same way: According to you, isn't it a problem?_____ is it a small problem?_____or, is it a large problem?_____

No.	Variable Name	Question	Response			
			Large	Small	No Problem	Don't Know
401	Wait_Time	The amount of time you waited	1	2	3	98
402	Ask_Q	The ability to discuss problems or concerns about your pregnancy with the provider	1	2	3	98
403	Exp	The amount of explanation you received about your pregnancy or any problems	1	2	3	98
404	See_cons	Privacy from having others see your consultation	1	2	3	98
405	Hear_Cons	Privacy from having others hear your consultation	1	2	3	98
406	Get_med	The availability of medicines at this facility	1	2	3	98
407	Clin_Hrs	The hours of service at this facility	1	2	3	98
408	Clin_Days	The number of days services are available to you at this facility	1	2	3	98
409	Clean	The cleanliness of the facility	1	2	3	98
410	Treat_Nurse	How the nurse/auxiliary/doctor treated you	1	2	3	98
411	Treat_AS	How the other staff, such as the CHW, treated you	1	2	3	98
412	Money	Cost for services or treatment	1	2	3	98
413	Other	Any problem you had today that I did not mention (specify)_____	1	2	3	98
414	Pat_Pay	Did you pay anything for any services provided today?	Yes……1 No……0 DK/Don't remember……98 Skip……99			**→415** **→end section** **→end section**
415	Pay_Total	What is the total amount you paid for all services or treatments you received at this facility today? Please include any money you paid for services, lab tests or medicines.	Total amount_____Gds (not Haitian dollars) Don't know/don't want to say……98 Skip……99			

5. Health and obstetric history

Now I am going to ask you some questions about yourself. I would like you to be honest with me so this information can help us improve the services at this clinic.				
No.	**Variable Name**	**Question**	**Response**	**Skips**
501	GA	How many months pregnant you are you?	Months_____ Don't know..98 Skip……..99	
502	Num_Preg	How many times have you been pregnant in your life? (include this pregnancy)	_____Times Don't know..98 Skip……...99	**If 1, skip to 504**
503	Num_Birth	How many times have you given birth to a live baby?	_____Times Don't know..98 Skip……..99	
504	Other_Prov	Have you seen a provider other than at this facility/clinic for care for this pregnancy?	Yes……1 No……..0 Skip……99	**→505** **→512** **→512**
505	OthProv_HC	Have you visited a doctor/nurse/nurse midwife/auxiliary that works in a health center, dispensary or hospital for this pregnancy, either at a public or private clinic?	Yes, private care provider……..1 Yes, public care provider……..2 No ……..0 Skip……..99	
506	OthProv_Mid	Have you visited a midwife (trained or untrained) for this pregnancy?	Yes……1 No……..0 Skip……..99	
507	OthProv_TH	Have you visited a traditional healer for this pregnancy?	Yes……1 No……..0 Skip……..99	
508	OthProv_Oth	Is there anyone else you have visited in this pregnancy?	Yes……1 Specify_____ No……..0 Skip……..99	
509	Total_ANC_Vis	How many times have you come for prenatal care at this facility/clinic and at any other health center or hospital or midwife or traditional healer for care for this pregnancy? **Do not count today's visit (Verify with Q 204)**	_____Times Don't know……..98 Skip……..99	
510	GA_Vis_1	How many months pregnant were you when you started prenatal care, either at this facility/clinic or elsewhere?	_____Months Don't know……..98 Skip……..99	
511	Rank_Fav	Among all the clinics you went to, which one is your favorite?	Health center/hospital……..1 World vision clinic……2 Midwife……..3 Traditional healer……4 No preference……5 Other……97 Don't know……..98 Skip……..99	
512	Closest_Fac	Is this clinic the closest health facility or clinic to your home?	Yes……1 No……..0 About the same as another……..2 Don't know……..98	**→514** **→513** **→514** **→514**
513	Reason_Clos_Fac	What is the main reason you did not go to the nearest facility or clinic?	Inconvenient operating hours……..1 Bad reputation…….2 Don't like personnel…3 No medicine……4	

			Prefers to remain anonymous……5 It is more expensive….6 Referral……..7 Other (specify)_____8 Don't know……98 Skip……99	
514	Rec_Ref	Have you ever received a referral by a health provider at this health center/clinic during this pregnancy?	Yes……1 No……0 Don't know……98 Skip……99	**→515** **→End section** **→End section** **→End section**
515	Why_Ref	Do you know for what medical reason you were referred to another provider?	High blood pressure…1 Bleeding……2 Swollen hands/feet…..3 Headache/dizziness….4 Other (specify)_____97 Does not remember/know/want to say……98 Skip……99	
516	Ref_Perf	Did you follow-up on this advice by going to see the provider recommended to you?	Yes……1 No……0 Skip……99	
517	Ref_why	Why did you follow-up/not follow-up on this referral?	Not enough money….1 Do not like health center……2 Problem of transport ……3 For my health……..4 For the health of my baby……..5 Because I was instructed to……..6 Other (Specify)_____97 Skip……99	

6. Demographic and general information

No.	Variable Name	Question	Response	Skips
601	Commune	What commune do you live in?	Hinche……..1 Thomonde……..2 Thomassique……..3 Cerca la source……..4 Boucan carre……..5 Cerca carvajal……6 Mirebalais……7 Saut d'eau……..8 Savanette……9 Lascahobas……..10 Other(specify)_____97 Don't know/don't remember……..98 Skip……99	
602	HH_Size	How many people sleep and eat in your house (include yourself in that number)?	_____People DK……..98 Skip……99	
603	U5	How many children under the age of five sleep and eat in your house?	_____Children DK…….98 Skip…..99	
604	HHF_1	In the past 4 weeks, have you ever had a time when there was no food to eat of any kind in your household?	Yes……..1 No……..0 Don't know/want to say…….98 Skip……..99	**→605** **→606** **→606** **→606**
605	HHF1_Freq	Did this happen 1-10 times In the past month or more than 10 times in the past month?	1-10 times in the past month….1 More than 10 times in the past month……2 DK/want to say……98 Skip……99	
606	HHF_2	In the past 4 weeks, have you ever had a time when someone in your household went to bed hungry?	Yes……..1 No……..0 Don't know/want to say…….98 Skip……..99	**→607** **→608** **→608** **→608**
607	HHF2_Freq	Did this happen 1-10 times In the past month or more than 10 times in the past month?	1-10 times in the past month….1 More than 10 times in the past month……2 DK/want to say……98 Skip……99	
608	HHF_3	In the past 4 weeks, have you ever had a time when someone in your household went a whole day and whole night without eating?	Yes……..1 No……..0 Don't know/want to say…….98 Skip……..99	**→609** **→End** **→End** **→End**
609	HHF3_Freq	Did this happen 1-10 times In the past month or more than 10 times in the past month?	1-10 times in the past month….1 More than 10 times in the past month……2 DK/want to say……98 Skip……99	

Interviewer: Please check each question to assure that everything is filled in properly. Once checked, the interview is over.

612	**RECORD THE TIME THE INTERVIEW ENDED ___:___**	

613	Do you have any questions for us?
614	Interviewer's comments:
Please say "Thank you for responding to our questions. I assure you that all the information you shared with me today will remain confidential. Please do not speak to the nurse or to other women about this interview"	

Appendix 3.5 - Patient Observation Oral Consent Form, 2012

Instructions for observer: Please read/say contents of this oral consent form to the patient you would like to observe before the start of her antenatal care observation. Please remember that the patient can refuse to participate at any time. Do not badger or try to convince her to participate if she does not want to.

Good morning/afternoon, my name is _____ and I am working on a research study sponsored by World Vision and Cornell University about antenatal care in Haiti. I would like to ask you to participate in this research study. If you are willing to listen, I will describe this study to you, answer any of your questions and you can let me know if you agree to participate.

The purpose of this study is to assess the antenatal care provided to women in different parts of Haiti to understand what works well and where improvements can be made. As part of this study, we are observing the antenatal care consultations of women at many different health clinics.

If you agree to participate in this study, I would like to observe your antenatal care consultation with the care provider today. I will stand in the room/area where the consultation takes place, but will position myself in a way that will respect your personal privacy. During this observation, I will not speak to you or to the care provider, but will observe and take notes about the care you received today. These notes will not be about your health status, but about the interaction between you and the provider. We will not record the interaction except to write down notes. These notes will not be seen by anyone but us.

I do not anticipate risks to you from participating in this study. Please be assured that whether or not you participate in this study, it will not affect the services you receive from this health clinic, now or anytime in the future. Should you accept to participate, you may change your mind at any time during the observation without any negative consequences. Again, your participation is voluntary. Any information you share with the health care provider will not be shared with anyone at this clinic or any of the women who seek care at this clinic. All information will be held confidential. I will not ask your name and your name will not appear on the form that I write. I will not allow anyone else to look at the notes I write down once it is filled in.

The information we gather from this study will be used to help antenatal care clinics improve their services in Haiti. We also hope that your own experience of receiving antenatal care will be improved over time as a result of this study.

There is no payment for taking part in the study.

Again, all the information I observe will be kept confidential. Your name will not appear on any form and will not appear in any report from this study.

Do you understand what I have explained to you? Do you have any questions that you would like to ask before making a decision about your participation?

In case you have any questions or concerns about this study later, you may direct them to Dr. Lesly Michaud in the World Vision office in Port-au-Prince. (Exact address is 9 Impasse Hardy, Juvenat, Route du Canape Vert, Telephone is 509 2257-0956)

Now that I have explained the purpose of the study and some of what it will mean for you to participate, would you like to participate in this study?

Appendix 3.6 - Patient Exit Interview Oral Consent Form, 2012

Instructions for interviewer: Please read/say contents of this oral consent form to the patient you would like to interview before asking her any questions. Please remember that the patient can refuse to participate at any time. Do not badger or try to convince her to participate if she does not want to.

Good morning/afternoon, my name is _____ and I am working on a research study sponsored by World Vision and Cornell University about antenatal care in Haiti. I would like to ask you to participate in this research study. If you are willing to listen, I will describe this study to you, answer any of your questions and you can let me know if you agree to participate.

The purpose of this study is to assess the antenatal care provided to women in different parts of Haiti to understand what works well and where improvements can be made. As part of this study, we are performing interviews with women who receive antenatal care at many different health clinics.

If you agree to participate in this interview, it will last approximately 20-30 minutes. During this time, I ask you about your experience at the clinic today and a few questions about yourself, your health and your health and nutrition practices.

I do not anticipate any risks to you from participating in this study. Please be assured that whether or not you participate in this study, it will not affect the services you receive from this health clinic, now or anytime in the future. Should you accept to participate, you may change your mind at any time during the interview without any negative consequences from us or the people who work at this health clinic. Again, your participation in this interview is voluntary. Any information you share with us will not be shared with anyone at this clinic or any of the women who seek care at this clinic. All information will be held confidential. I will not ask your name and your name will not appear on the form that I write on nor in any report that is written about this research. I will not allow anyone else to look at the interview form once it is filled in.

The information we gather from this study will be used to help antenatal care clinics improve their services in Haiti. We also hope that your own experience of receiving antenatal care will be improved over time as a result of this study.

There is no payment for taking part in the study.

Do you understand what I have explained to you? Do you have any questions that you would like to ask before making a decision about your participation?

In case you have any questions or concerns about this study later, you may direct them to Dr. Lesly Michaud in the World Vision office in Port-au-Prince. (Exact address is 9 Impasse Hardy, Juvenat, Route du Canape Vert, Telephone is 509 2257-0956)

Now that I have explained the purpose of the study and some of what it will mean for you to participate, would you like to participate in this study?

Appendix 3.7 – Outcome indices for eight care components

Care Component 1: Intake

All women, regardless of visit number (8 items)	**Additional items for all women presenting for first visit (11 items in total)**	**Additional items for women in first visit, not first pregnancy (16 items in total)**
Ask if client is taking medications	Patient age	Prior stillbirth(s)
If the clients has experienced any of the following danger signs: Bleeding	Number of prior pregnancies client has had	Infant(s) who died in the first week of life
Fever	Date/month client's last menstrual period began	Heavy bleeding during or after delivery
Heachaches or blurred vision		Previous assisted delivery (Cesarian section, ventouse or forceps)
Swollen hands or face		Previous spontaneous abortions
Tiredness or breathlessness		
Whether the baby has moved/stopped moving		
Whether there are any other symptoms or problems the client thinks might be related to this pregnancy		

Care Component 2: Physical Exam

All women, regardless of visit number or months pregnant (4 items)	**Additional items for all women presenting for first visit (6 items in total)**	**Additional items for added if a woman is 5 or more months pregnant (7 items in total)**
Take the client's blood pressure	Take the client's height	Palpate the client's abdomen for fundal height (or conduct ultrasound)
Weigh the client	Conduct vaginal exam/exam of the perineal area	Listen to the client's abdomen for fetal heartbeat with a fetoscope or fetal monitor
Take the client's temperature		Examine the client's breasts
Examine legs/feet/hands for edema		

Care Component 3: Lab Exam

First Visit Only **(6 items)**	**Additional items for first pregnancy, first visit only** **(7 items in total)**
Perform or refer (in same institution) for anemia test	Perform or refer(in same institution) for sickling test
Perform or refer (in same institution) for syphilis test	
Perform or refer(in same institution) for malaria test	
Perform or refer (in same institution) for HIV test	
Perform or refer (in same institution) for urine test for protein	
Perform or refer (in same institution) for urine test for bacteria	

Care Component 4: Distribution of supplies, IFA and TT

All women **(3 items)**	**Additional items for first pregnancy, first visit only** **(4 items in total)**
Prescribe or give iron or iron folic acid pills	Prescribe (in the same institution/program/rally post) or give tetanus toxoid (TT) injection
Client given ITN free of charge	
Client purchased ITN from provider	

Care Component 5: Health education and counseling

All women, regardless of visit number (19 items in total)
Discussion of danger sings, including: Vaginal bleeding
Fever
Excessive tiredness or breathlessness
Swollen hands and face
Severe headache or blurred vision
Explain the purpose/benefit of iron or iron folic acid (for prevention or treatment of anemia/they give blood or energy/they protect health of the woman or her baby)
Explain how to take iron or iron folic acid (normally 1 pill per day)
Ask the client where she will deliver
Advise the client to use a skilled health worker during delivery (Doctor, nurse or midwife, but not a TBA)
Mention planning for transportation during labor (either to place of delivery or for emergency care during home delivery)
Mention setting aside money for emergencies at the time of delivery
Discussed importance of having at least 3 prenatal visits
The quality or quantity of food to eat during pregnancy, other than foods with iron
Describe foods that are high in iron (meat, leaves, fish, beans, bean sauce, spinach. NOT carrots, other vegetables, bananas or plantains)
Advised the mother to exclusively breastfeed for up to 6 months
Discuss family planning for use after delivery
Provide or refer (in same institution) for counseling related to HIV test
Explain the purpose of a tetanus toxoid (TT) injection
Importance of mosquito net (ITN) explained explicitly

Care Component 6: Health Provider Communication and interpersonal delivery

All women, regardless of visit number **(8 items)**	**Additional items if client received antibiotics** **(10 items in total)**
Did the provider ask whether the client had any questions?	If given antibiotics, were instructions, including how often and how long to consume antibiotics provided?
Inform the client about the progress of the pregnancy	If given antibiotics, was reason given to client why antibiotics given?
Did the provider speak to the client/answer questions that could be understood by the client?	
Did the provider speak politely to the client?	
Did the provider explain the reason that she performed any of the services she performed?	
Did the provider use her cell phone during the consultation with the client?	
Did the provider use any visual aids for health education or counseling during the consultation?	
Provider told patient estimated date of delivery	

Care Component 7: Infection Prevention and Control

All women, regardless of visit number **(2 items)**
Did provider wash hands/disinfect hands/change gloves before touching this client?
Did provider correctly dispose of all medical waste from this client? (Needles in a plastic or a cardboard box with a cover, liquid in a recipient that has a cover, any gauze with bodily fluid in a container with a lid)

Care Component 8: Documentation

All women, regardless of visit number **(2 items)**
Did the provider write on the client's health card (retained by the woman)?
Did the provider write on the client's facility/clinic card (retained by the facility)?

Appendix 3.8 – Fixed Effects Included in Models

Variable	Hypothesis
Order of a woman observed throughout the day	Women seen earlier in the day (lower order number) will receive better quality due to provider fatigue.
If it was a woman's first time at the clinic	Women who attend clinic for first time receive higher quality in all outcomes. Providers might be more diligent in all areas of care for women who come for their first visit.
Primagravid	Women who attend clinic for their first pregnancy will receive higher quality in education and counseling, since this is their first exposure to ANC.
Number of months pregnant	Women later in pregnancy will receive better quality care in the physical care component since their birth is imminent. Women earlier in pregnancy will receive better education and counseling, so as to lay the groundwork for needs at birth.
Observer	Placed in model to control for potential bias introduced by variation in observer

Appendix 3.9 – Aspects of Perceived Quality

1. Wait time
2. Ability to ask questions
3. Amount of information received from provider
4. Visual privacy of consultation
5. Auditory privacy of consultation
6. Availability of medicine/supplements
7. Clinic hours
8. Days of available service
9. Cleanliness
10. Treatment by care provider
11. Treatment by other clinic staff
12. Cost of consultation and treatment

Appendix 3.10 – Variable Codes Used in Models

Variable	Coding scheme
Fixed vs Mobile Clinics	0-Fixed clinics 1-Mobile clinics
Order of women seen throughout day	Continuous
Observer	1 - Observer 1 2 - Observer 2 3 - Observer 3 4 - Observer 4
First Visit	0-Not first visit 1-First visit
Primigravid	0-Multigravid 1- Primigravid
Number months pregnant	Continuous

Appendix 3.11a - Percent of Women Receiving and Stating Educational Messages by Topic

Note: Due to clustering of data, this presentation is not quite right and I shouldn't (technically) test for significance or present in this way. I would have to present as ORs or predicted probabilities. Shown here for as a reference.

	Percent of women who received information about topic in fixed clinics (n=212-215)	**Number of women who could state one correct piece of information in fixed clinics**	**Percent of women who could state at least one correct piece of information in fixed clinics**	**Percent of women who could state at least two correct pieces of information in fixed clinics**	**Percent of women who received information about topic in mobile clinics (**n=360-370)	**Number of women who could state one correct piece of information in mobile clinics**	**Percent of women who could state two correct pieces of information in mobile clinics**	**Percent of women who could state at least two correct pieces of information in fixed clinics**
Birth preparedness and emergency readiness	30.37	n=65			42.78	n=154		
Birth preparation			95.38	38.46			94.16	52.60
Pregnancy danger sign			46.15	30.78			53.25	28.57
Birthing danger sign			16.92	1.54			21.43	3.25
Duration of exclusive breastfeeding	57.75	n=123	91.87	N/A	82.02	n=301	96.68	N/A
Reason for tetanus toxoid vaccine[a]	77.21	n=166	42.17	N/A	72.16	n=267	23.22	N/A

*Statistically significant at p≤.05

Acceptable responses by question in Appendix 3.11b

[a]Asked if ever reporting TT in current or previous pregnancies

Appendix 3.11b – Acceptable Reponses for Educational Topics

Topic	Accepted Responses
Birth preparedness and emergency readiness	
Birth preparation	Transport plan in case of emergency Money Disinfectant Razor Gloves Cotton Baby clothes Food
Pregnancy danger sign	Hemorrhage Fever Swollen hands or face Fatigue/shortness of breath Headache or dizziness Convulsion Do not feel movement of baby/decrease in movement
Birthing danger sign	Bleeding/hemorrhage Fever Genital injuries
Exclusive breastfeeding duration	6 months
Reason for tetanus toxoid vaccine**	Tetanus For a disease or infection For my health and the health of my baby

Chapter 4 – Antenatal care provider behavior in Haiti: beliefs, barriers and coping strategies

Abstract

High-quality performance of health care providers is essential to the success of health and nutrition programs. Individual, environmental and social factors can influence provider behavior, but the multiple dimensions of these factors and their interactions are not well understood in developing country settings. Antenatal care (ANC) interventions can contribute to multiple positive maternal and neonatal health outcomes, yet ANC is not well implemented in Haiti partially due to poor health worker performance. The objective of this study was to explore provider-level factors that determine ANC behavior in difficult working conditions. We performed 18 semi-structured interviews with ANC providers in central Haiti and analyzed the data using a mix of predetermined and emerging codes, organized into three main themes. We found that provider beliefs about ANC often clash with the conditions they face, forcing them to develop coping strategies. These coping strategies reflect providers' individual beliefs, including expectations of care, personal experience with ANC receipt and provision, and views on most important components of care. However, individually-developed coping strategies lead to inconsistent care that does not reflect current ANC guidelines. To improve provider performance, multiple strategies are needed. Reduction of environmental barriers to providing high-quality care, such as supply chain improvements and increasing the provider-patient ratio, are essential starting points. Equally as important to positive behavior change are interventions such as audit and feedback and job aids, designed to account for individual beliefs of providers.

Introduction

Poor performance of health workers, often defined as low adherence to clinical guidelines, is a contributing factor to continued poor health outcomes and has been documented for multiple health and nutrition programs in many low-income countries (1-8). Identifying the determinants for provider behavior and performance[13] is a growing area of research and essential to design effective interventions to improve quality of care, a priority for low-income countries to help meet the Millennium Development Goals and for the long-term functioning of health systems (1, 9-11).

Health worker behavior, and therefore performance, is determined by multiple factors at individual, environmental and social levels (12) (13-15). These factors are "transactional", interacting in a unique way for each individual worker (16). Michie has identified twelve theoretical domains that influence provider behavior and behavior change, the majority of which are sub-domains of the individual level (Table 4.1) (12). These have been condensed from 33 psychological theories about worker behavior and behavior change for application in health service research (12).

How individual theoretical domains interact, leading to provider intentions and behavior, is not well understood, but is thought to affect worker behavior directly and "mediate how workers process the outcomes or consequences of their actions" (13) (pg. 1258) (12, 17). Social cognitive theories, notably the Theory of Planned Behavior, are most often applied to explain behavior change at the individual level, with certain domains within these theories studied more than others (18). These include motivation and goals (intention), beliefs about capabilities (self-efficacy) and beliefs about consequences (17, 18). Additionally, how individual-level domains interact with social and structural-

[13] Behavior is defined as "the way in which one acts or conducts oneself" (Oxford Dictionary). Health care provider behavior is observable and can include measurements of quantity, quality and time (Kanfer, 1999).

Health worker performance is defined "adherence to an accepted standard or guideline" (Rowe et al., 2005) and can be conceptualized as how behavior is classified according to a select set of clinical guidelines.

level domains have not been clarified. The outcomes of these interactions among domains likely vary by individual provider and depending on environmental characteristics (12, 13, 19). For example, the literature about worker motivation states that motivation exists when there is alignment between a worker's goals (individual level) and those of the organization (structural). Without such alignment, a worker would likely become frustrated and demotivated (16).

Table 4.1- Level and corresponding theoretical domains of health care provider behavior

Level	Theoretical Domain
Structural	Environmental context and resources (environmental constraints)
Social	Social influences (norms)
Individual	Knowledge Skills Social/professional role and identity (self-standards) Beliefs about capabilities (self-efficacy) Beliefs about consequences (anticipated outcomes/attitude) Motivation and goals (intention) Memory, attention and decision processes Emotion Behavioral regulation Nature of the behaviors

Adapted from: Franco et al., 2002 and Michie et al., 2005

Interactions between the theoretical domains of health care provider performance in developing countries have been qualitatively studied for select health services, such as malaria treatment (20) and the Integrated Management of Childhood Illness (IMCI) (21) and in relation to controversial policies such as abortion (22), and policy changes, including health financing and elimination of user fees (23-25). However, they are not well understood for antenatal care (ANC), the care a woman receives during pregnancy. Previous studies of determinants of ANC worker behavior identified primarily structural influences of care, including inadequate numbers of staff, lack of training and feedback, absenteeism, supply shortages and working tools that were not consistent with guidelines (26-30). In some cases, providers spoke of establishment of informal rules and routines to cope with difficult structural

characteristics and policy changes (26, 30). These studies did not identify determinants of behavior in the individual-level domains, nor identify how these might interact with the environmental-level factors, leaving a gap in understanding of why ANC providers act as they do.

The objective of this study was to explore factors that contribute to ANC provider behavior and decision making in difficult working conditions. Specifically, we wanted to elucidate beliefs about consequences of ANC, including beliefs about ANC effectiveness and quality of ANC (individual-level factors), identify barriers to provider perception of ideal ANC implementation (individual-, environmental- and social-level factors) and identify ways in which these might interact to affect behavior. To our knowledge, our study is the first to investigate these determinants of behavior for ANC providers.

Methods

Study area

This study was conducted as part of a larger study about ANC care quality in Haiti that included observations of care providers and a survey with recipients of care that assessed women's knowledge and perceptions of care quality. ANC providers who work in fixed (non-mobile) clinics and mobile clinics sponsored by the non-governmental organization World Vision in the Central Plateau region of Haiti participated in this study. ANC coverage in Haiti is high compared to similarly developed countries (31). In the department of the Central Plateau, 94% of women seek at least one antenatal care visit with a skilled provider, the highest in the country (32). Forty-three care providers were observed performing 999 ANC consultations over a two-month period in both fixed and mobile clinics. This study concluded that the quality of ANC was weak in multiple areas of care provision when compared to Haitian ANC guidelines (33). The percent of total services delivered to women was under 50% for the intake process of patients, delivery of education and counseling, health provider communication and lab testing in both

clinic types. A survey of 585 care recipients revealed that knowledge about educational topics was low, but recipients rated the quality of care highly in both clinic models.

Data Collection

Twenty ANC care providers who were observed as part of the larger study were randomly selected to participate in semi-structured interviews after the observation portion of the study ended. Interviews took place in July and August of 2012 and lasted 30-60 minutes. Interviews were held in quiet, private locations within health centers for fixed clinic staff and in World Vision regional offices for mobile clinic staff. All interviews were performed in Haitian Creole by a trained research assistant using an established interview guide, following-up on responses and probing when necessary (Appendix 4.1). The primary author and analyst (EP) is conversant in Haitian Creole and was present at all interviews to observe and take notes. All interviews were audio recorded. Transcription was performed by two research assistants, one of whom performed the interviews. Analysis was conducted primarily in Creole, but interview sections were translated into English as needed.

Data Analysis

All transcripts and field notes were reviewed twice then coded using a mix of predetermined and emerging codes. Coded data were then reviewed and further organized into thematic categories and sub-categories that emerged from the data. We used ATLAS.ti (Scientific Software Development GmbH, version 7.1.7) to assist with analysis. To strengthen reliability of the data, transcripts were checked for mistakes made in transcription and coding processes and for any drift in the definition of codes (EP) (34). These themes were described and interpreted for their implications. Where possible, data were compared to existing literature on health worker motivation theories and previously identified determinants of ANC or maternal health provider behavior.

To increase the validity of the analysis, we triangulated data to compare and contrast findings between interview questions, and between interviews and observations of care providers and surveys with ANC recipients (35). The use of this mixed-method data analysis allowed us to test for consistency between data sources (35). According to Patton, the objective of such triangulation is not to show different types of data reveal exactly the same results, but to explore why conclusions could be inconsistent using multiple methods (35).

Ethical Approval

The research study was approved by the Cornell University Institutional Review Board and the Haitian Ministry of Health (MSPP) Public Health Bioethics Committee. All participants provided oral approval to participate in the interviews after being provided with information about the study, the use of the data and the pros and cons of participation (Appendix 4.2).

Results

Of the 20 randomly-selected care providers, all agreed to participate in the study, but two were unavailable due to scheduling conflicts, resulting in a final sample size of 18 (Table 4.2). The sample was almost evenly split between ANC providers who worked at fixed and mobile clinics, was predominantly female, and represented a large range of experience between providers, from 6 months to 28 years.

Influences on provider behavior for ANC

We asked ANC providers to share their views about ANC, both in general and specifically related to their previous or current work. As ANC and maternal health providers with many years of combined experience in the Haitian health system, they offered unique perspectives of ANC and how ANC functions (or does not) in this system. Providers were generally open to participating in the interviews and in most cases, researchers perceived that participants spoke candidly about their work. Based on

provider responses, three main themes emerged from the interviews: 1) beliefs about ANC outcomes, effectiveness, delivery and quality, 2) barriers to implementation of desired ANC, and 3) decision making and coping strategies. Each theme is discussed in detail below.

Table 4.2 – Characteristics of interview participants

Characteristic	Number (% or range)
Type of clinic where work	
Fixed	8 (44%)
Mobile	10 (56%)
Type of ANC provider	
Doctor	1 (6%)
Nurse midwife	3 (17%)
Nurse	5 (28%)
Auxiliary	9 (50%)
Gender	
Female	16 (89%)
Male	2 (11%)
Average number of years in current position	4 (0.5-28)
Average number of years since receipt of highest degree	10 (1-28)

Note: percentages may not add to 100 due to rounding

1. Beliefs about ANC

Outcome expectations: optimism for ANC

ANC providers believed that ANC can affect a wide range of objectives and outcomes and were overwhelmingly positive in their views on how ANC can help a woman during pregnancy. The majority of providers stated that ANC was useful to monitor the pregnancy, prevent complications and identify and treat problems that could arise, including HIV/AIDS, anemia, pre-eclampsia and eclampsia and malpositioning of the fetus. Education was viewed as an important outcome in itself, but also one that could teach women about recognition of danger signs and the importance of hospital delivery so that they could seek appropriate care when needed.

A few providers went beyond describing objectives of care and reasoned that through prevention, detection and treatment of certain conditions such as anemia and pre-eclampsia, ANC could ultimately reduce maternal and neonatal mortality, indicating that some providers had "causal pathways" in mind for their work. For example, one provider spoke about ANC's value to reassure women of the progress on their pregnancy, believing that this psychological assurance could lead to positive health outcomes.

Some providers believed that ANC can improve, predict or even guarantee positive delivery outcomes, both for the mother and the baby,

> Antenatal care allows you to see in advance how the pregnancy will unfold. You have time to get an idea of how the birth will go and how the child is. Antenatal care is not only useful for the mother, it also helps the baby. It allows us to see how the baby is progressing (Nurse midwife 4, fixed clinic).

Another provider was even more adamant about the short- and long-term benefits of ANC, revealing unrealistically high expectations for what ANC can accomplish,

> Respondent: (ANC) makes a healthy child and the mother is also in health.
>
> Interviewer: When you say healthy, do you mean during the pregnancy?
>
> Respondent: While she is pregnant, after the birth, for the rest of her entire life
>
> Interviewer: What do you mean by a healthy child?
>
> Respondent: A child who is not sick. If a woman does not have anemia, normally the child should be born fine. For example, myself, I was not anemic at 15 g. When I had my child, he was always healthy. He was never sick, never had diarrhea, nothing (Auxiliary 5, fixed clinic).

<u>Important components of care: ANC as a "package"</u>

Views about the most important components of care varied widely. Some providers identified components of care they would provide to all women, like measurement of blood pressure, but some said that the most important components of ANC must be based on individual circumstances and would vary for each woman depending on her health, situation or the gestational age of the fetus,

> When a woman comes for her consultation, the first thing is the welcome. The second service is for the woman to receive care depending on the kind of problem she has (Auxiliary 5, fixed clinic).

The idea of ANC as a "package of services" emerged, as some providers described ANC as a grouping of services that should or must be delivered as a unit. As such, some could not single out any particular services of ANC as the most (or least) important, as illustrated by these quotes,

> ANC is like cooking food. There are the spices and all the things you put in to make the food (taste) good. And for the women, it is the consultation, not only the medication that helps her. Right from the beginning, the woman from head to toe, should, as she walks in, receive a packet of service (Auxiliary 16, fixed clinic).

> I think all (ANC services) are important. It is all of the pieces together that make antenatal care…. The consultation, lab exams, advice, vitamins and birth planning (Nurse midwife 4, fixed clinic).

Other providers could separate the "package" and stated priority services, for example,

> Normally, first (in importance) they should receive education. And second, it is required that they should receive medication (Auxiliary 15, mobile clinic).

<u>Delivery of care: "welcoming" patients and meeting their needs</u>

The majority of providers perceived the interpersonal interactions between themselves and the patients as important for multiple reasons. The most basic reason is to develop a rapport with the client and make her feel supported,

> Good quality care for a pregnant woman involves making her feel good in her own skin, giving her affection when she comes to you, talking to her like she could handle any little problems that she has at home (Auxiliary 9, fixed clinic).

In addition to developing a rapport, providers believed it their responsibility to treat the patients well, believing that the treatment of and relationship with patients acts as a mediator of other aspects of care,

> First of all, I want to tell you that the way you receive a woman at the clinic for the first time might motivate her to come back again or the opposite. If you take time to talk to the woman when she comes, you show her your interest in serving her at the clinic, you show her that you understand that she is a human being as you are and you show her your interest in helping her beyond money, this woman likely will come back for her appointment. This woman will more likely be open with you the next time and tell you about her problem because you put her at ease to talk to you about anything (Nurse 2, mobile clinic).

Many providers also stated that a woman will "not hear anything that is told to her" without a warm "welcome" or that she may not return for care in the future if she does not feel well-received by the provider.

Providers expressed great frustration at not being able to meet all of the needs of a patient due to lack of resources of the health system or patient. Referral care was considered necessary for certain conditions, but providers were aware that women often lacked the transportation fees to access the referral center. When providers do not have sufficient or appropriate medications, they write prescriptions for women. But most providers knew that purchasing those prescriptions at a pharmacy will cost more than what most women can afford and they are not likely to purchase them. Advising a woman to seek referral care or giving her a prescription knowing that her level of resources will prevent her from doing it was viewed as poor care provision. Expressing her frustration at not being able to do more one provider stated,

> You have the means to provide someone with good-quality care, but it is weak, it becomes weak because there are no means to help the person completely. If you give a woman a message but she does not have the means to eat or she does not have money, it is as if what you gave her was nothing (Nurse 8, fixed clinic).

Education is part of the Haitian ANC Guidelines with nine recommended topics of care to be carried out in 15 minute educational sessions (36). Educational topics including recognition of danger signs, planning for birth and nutrition education were perceived as important components of ANC. Not only is the content viewed as important, but one provider mentioned its means of delivery as well,

> When you're doing education, the woman needs to listen to you and understand what you say. The woman should be able to answer your question if you ask her things you have discussed with her during the educational process. The nurse has to be patient in all circumstances (Nurse 2, mobile clinic).

In Haiti, providers with various levels of training can deliver ANC, depending on where they work. Auxiliaries are the least trained providers, with 1-2 years of training after receipt of a high school degree. Nurses and nurse midwives have at least 2-3 years specialized training after graduating from high school. Nurses and nurse midwives often referred to poor-quality care as being provided with "unqualified" or "inexperienced" personnel. Only one provider was willing to provide sufficient detail to express concerns that auxiliaries might not be sufficiently qualified to deliver ANC,

> As long as you are trained, the more capacity you have to do things well. If you take an auxiliary who just started working, you would not have the same results as someone who has experience and is more trained than that (Nurse midwife 6, mobile clinic).

Additionally, due to the multitude of private and public health professional schools, even ANC providers with the same title may not have received uniform training. One provider expressed frustration at this lack of consistency,

> The ones in charge should take the time to train the people who give care. They should give a training just so that all things are standard, which means that you should see the same care everywhere. Because it is not possible for me to give one level of quality of care and another to give a different level… if we want a good quality of care, all given the same way, we should all be on the same wavelength… (Auxiliary 14, mobile clinic)

Additional descriptions of desired delivery of ANC included respecting the privacy of women during the consultation, approaching women with a sense of equality ("treating everyone the same whether they have 0 or 1 cent"), and proper handling of emergencies.

<u>Intrinsic motivation for care delivery: professional conscience and life experience</u>

Providers were asked to describe high- and low-quality ANC, both in general and specific to their work site. Providers mentioned that high-quality care includes the prevention of possible poor outcomes and

the avoidance of provider mistakes. Providers worried about making mistakes that could have grave consequences, such as giving the wrong medicine or missing a diagnosis that could lead to poor outcomes,

> For example, if you are taking a blood pressure, you have to make sure that you take it right. Otherwise, you can give the wrong medicine to the women, which can be dangerous for her. You have to know the exact blood pressure so you know what quality and quantity of medicine to give to the woman (Nurse 2, mobile clinic).

Providers' "professional conscience" and their life experiences were mentioned as individual-level factors that also influence their behavior. Professional conscience was stated by multiple providers as a way to persevere when working in difficult conditions. It was described as affecting the way providers approach their work and their patients,

> It depends on one's professional conscience. Every person goes to school, where you go to learn and become informed. But there are some people in the school who say 'I am learning a profession', but he doesn't really. He is just there for the money, even if he does not want that to be true. But you also meet those who do learn the profession, who like their profession, who have a professional conscience. And they will like all patients. When a patient is in front of you, you feel good, not annoyed (Auxiliary 9, fixed clinic).

Women were the majority of ANC providers and the majority of interviewees. Many of these women spoke about the importance of providing ANC based on their personal experiences of becoming and being mothers,

> I don't think it has ever happened that I haven't given good care because I am a mother of young children. I know that it is a very difficult thing. I had two pregnancies while working in the field. It was not easy. I think you need to put yourself in the place of others. I am a mother and I because I can relate to the person, I always give the best care possible (Nurse 1, mobile clinic).

2. Barriers to providers' perception of ideal care provision

Environmental context and resources: too many women and too few resources

ANC providers in Haiti identified numerous environmental and resource factors that positively and negatively affect their behavior. The most salient theme that emerged was the volume of women seen per day at health centers. Providers stated that a high patient-to-provider ratio[14] can lead to poor care and poor interpersonal interactions, the possibility of making mistakes, incomplete care (lack of the "full" package), provider exhaustion and supply shortages. Providers spoke about trying to perform what they considered too many consultations per day and the effect this has on their behavior, including the interpersonal nature of the visit,

> Sometimes we have over 200 women to see. After you see 60 or 80, you can't hear the stethoscope and it makes your ears hurt. Tensions may rise. You see what I mean? It is the women who are seeing you... On a Tuesday we were able to provide good-quality care because there were not a lot of women (Auxiliary 10, mobile clinic).

Others described how high volumes of women led to providers feeling rushed and not being able to perform the full package of care,

> And also, if I leave (the clinic) without having the time to care of a woman and I say to her 'Hey miss, you're good, you can go. And you, you're good' it is poor-quality care. In a consultation the woman should have her time. If we say from head to toe, to look in her eyes, her breasts... for you to look at all the things it takes time. If you do not have time to do it all, it is already poor-quality (Auxiliary 16, fixed clinic).

Making mistakes could also be caused by the high volume of women they see, resulting in provider frustration and anxiety,

> To tell the truth, we used to have 80 women at the mobile clinic. We take their blood pressure because we can't send them home without doing so. If we don't do that it can be dangerous for the women. Let's suppose that a woman comes to a clinic where her blood pressure has not

[14] Data from other portions of the study partially support these claims. Providers perform an average of 18 consultations per day, with a range of 2-55 (n=999)[14]. The mean time that providers spend with women is 11 minutes for a first visit (n=601) and 9 minutes for follow-up visits (n=352) with a range of 1-30 minutes.

> been checked and then on her way home she faces a high blood pressure crisis and dies. How would the nurse feel in this particular case? That would be the worst feeling ever... (Auxiliary 7, mobile clinic)

Providers lamented not being able to perform certain services because of missing materials or supplies, which they viewed as an organizational problem and out of their control. Multiple providers complained about not having a working blood pressure cuff or adequate amounts of antibiotics, iron-folic acid or multiple micronutrient supplements,

> What can really affect the antenatal care, I think, are the materials. If we don't have materials, we can not provide good-quality of care. For example, you can not take blood pressure if your blood pressure monitor is defective. You need to have a good scale, for instance, to weigh a woman. Also, the medicine. There are some medications that you have to be able to give to the woman such as iron-folic acid, multivitamin etc… if you don't have these medicines to provide to a pregnant woman… she will not be able to buy them if you give her a prescription, and it does not mean anything for her to come to you. This really can not help her (Nurse 1, mobile clinic).

Not being limited by resource constraints and being able to provide "everything that we have" or "everything a pregnant woman deserves" leads to provider satisfaction,

> When a person comes you start with the welcome. Since her arrival, the way you welcome her should be so that she feels she will survive. That means when the person shows up, you welcome her, you do the consultation, give education, take her weight and height, you join with her, you take her blood pressure, you do all the things for her. This means that in your mind, you can say that you performed good consultations today (Nurse 8, Fixed clinic).

Haitian guidelines recommend referral to secondary or tertiary care based on certain demographic characteristics or suspected complications (36). Proper referral of women due to a medical need was viewed as high-quality care. In contrast, when providers are forced to refer women due to lack of resources or materials that they believe they should have, such as laboratory exams or medications, it was deemed poor-quality care,

> If you are in a location where you do not have materials, even quality personnel give low-quality care. If the institution does not respond, for example, you can't test for hemoglobin, the institution has to send that person to go elsewhere (Nurse midwife 12, fixed clinic).

Providers also mentioned environmental-level barriers to care from the women's perspective, including constrained geographic and financial access to care (due to transport fees), which can negatively affect the timing and frequency of care. Providers had intimate knowledge about the communities from which their patients come and the circumstances and barriers they face, as shown by this statement,

> Let me give you an example of poor-quality care. If you take preventive care… if a person lives in in the mountains in a remote place and she was supposed to come receive care that you cannot take to her… and the person does not come to receive care. So, what she should have received, since she does not have the means to come and get it, she does not receive at all (Auxiliary 14, mobile clinic).

Having clear guidelines and being informed and trained on these guidelines have previously been identified as an important determinant of care provision (37, 38). When asked, 50% of providers knew of their organization's guidelines and 44% of those had received training on them. Interestingly, Haitian ANC guidelines recommend three ANC visits throughout pregnancy, one in each trimester (36). However, not one of the institutions we visited respected this recommendation. All institutions recommend women attend ANC at least monthly and some institutions ask women to come every other week in the seventh and eighth month and weekly in the ninth month. All providers felt that at a minimum, women should attend monthly visits and that one per trimester was not sufficient.

Finally, supervision and feedback are also critical to performance of health workers. If done well, supervision can lead to increased worker satisfaction and motivation (9). In this study, 78% of ANC providers reported that they receive some kind of supervision, although the frequency varied from weekly to annually. Of those who were supervised, 86% received oral or written feedback. One provider expressed dislike of supervision, which she found to be punitive,

> Haitians don't like to complement you, but they will report you if you don't so something well (Nurse 2, mobile clinic).

In contrast, feedback with supportive and helpful advice perceived to improve provider performance was viewed in a positive light,

> Yes, it (supervision) is useful. For example, Haitians have a thing against being supervised. Some supervisors can be burdensome… Meanwhile, it is useful (if) they make recommendations on how to do things differently and they can also applaud you on things that you do well. But if the person gets some advice and remains mediocre, it is not the fault of the person who supervises them because she helped you to do better. That's where I see supervision is useful, whatever the job (Auxiliary 14, mobile clinic).

Social influences

Three social influences that affect provider behavior were identified. Providers expressed the need to conform to site-specific standards,

> I respect all the norms, like the proverb says 'when you go somewhere you find everyone dancing the same steps, you dance the same steps too' (Nurse 8, fixed clinic).

In addition to peer pressure at the institutional level, providers described feeling pressure by patients to quickly perform ANC consultations when there are a lot of women so that the women could return home. Providers stated that many women travel long distances to visit them, often without having eaten. If these women are forced to wait for a consultation until late in the afternoon, they become dissatisfied and will let the provider know, pressuring them to speed up.

Finally, even those providers who were not mothers and did not discuss their own pregnancies shared socio-cultural beliefs about women and reproductive health in Haiti. Discussing the importance of ANC one stated, "women cannot give life to another and lose theirs along the way". Additionally, there is an Haitian proverb that translates to "children today, adults tomorrow." This proverb was stated by numerous providers as a way of expressing that today's investments in the health of pregnant women and young children will lead to a healthy population.

3. Decision making in context and coping strategies

Decision making emerged as a salient topic given the difficult environments and limited resources (time, staff and supplies) that providers described. One important decision providers are often forced to make

is how to ration care, prompting us to ask, how do provider beliefs about ANC and day-to-day barriers interact and lead to decision making about individual care? To assess this question, we asked providers to role play how they would manage a situation with more women than they can reasonably see in one day. Providers stated three ways in which they cope: 1) focus on or neglect certain women, 2) focus on or neglect certain ANC services, and 3) change the structure of activities to accommodate the volume of women.

If providers focus on certain women (and neglect others), their decision can be based on the health of woman: if she is considered at-risk, the stage of pregnancy, and in the World Vision program, if she is pregnant or post-partum. Different providers have different decision processes for how to handle these situations. Providers who focus on (or neglect) certain ANC services also have different decision rules. Some will shorten the education component and others will "not make women lie down" to measure uterine height, listen to the fetal heartbeat or palpate for fetal positioning. There was, however, consensus that taking blood pressure should never be neglected. Finally, to cope with the high volume of women, some providers will instruct women to come back the next day or reschedule the educational component of the ANC visit to a different time.

Discussion

The objective of this study was to explore factors that shape ANC provider behavior. Specifically, we investigated how provider beliefs about ANC interact with environmental and social factors and, ultimately, could influence care provision. Alignment of beliefs with environmental factors likely leads to greater motivation and satisfaction of providers than a situation in which barriers prevent a provider from acting on their beliefs (13). The latter situation has been shown to lead to frustration and demotivation in African health care workers (15). We found multiple examples where working

conditions did not allow providers to perform as they stated they should under ideal conditions, forcing them to make decisions about how to proceed in these less than ideal circumstances.

Beliefs about ANC

The literature on maternal health contains numerous examples of poor-quality interpersonal relations between health providers and patients, including providers treating women disrespectfully, dismissively and in some cases verbally or physically abusing them (27, 29, 39-41). In contrast to these articles, ANC providers in this study believed that treating women well, speaking to them respectfully and in a way that "showed interest in them" was an important mediator that could help to achieve other goals of ANC, such as education and counseling and women's utilization of ANC. These claims are supported by research in the United States showing that patient perceptions of service quality, including the interpersonal dimensions of care, are an important mediator of trust (42) and patient behavioral intent (43).

To strengthen the validity of this data and to evaluate consistency between data sources, we compared responses about treatment of women to those from the larger study of ANC observations and survey with women (35). Observation data showed that 98% of provider-patient interactions were judged by observers to be polite, with only one provider impolite to more than two patients (33). The exit survey with care recipients was consistent with our observations and provider statements; ninety-seven percent of women are pleased with the treatment they received from health staff and providers (33).

It is clear that the majority of providers were acting in accordance with their beliefs about how women should be treated in the Haitian health system and culture, but it is not clear <u>why</u> Haitian providers appear to be the anomaly in the literature, rife with examples of abuse of judgmental behavior. One possible reason is intrinsic motivation of providers, who tended to relate personal experiences to their professional outlook. Multiple providers referred to their own pregnancy experiences as a motivating

factor for treating women well. Pregnancy can be a meaningful life event with strong socio-cultural significance, one that Haitian women experience at a relatively high rate (Total fertility rate=3.5(32)). Providers in other health domains could relate personal experiences to patients, but these experiences are likely to be less profound and universal. To our knowledge, personal experiences of a health state or condition have not been previously identified as intrinsic motivator for maternal health providers.

Linking personal experiences to the care they provide can be beneficial if it is intrinsically motivating to the provider. In some cases, however, use of personal experience as a motivator could cause the providers to unnecessarily reinforce certain interventions or provide women with incorrect information. For example, one provider stated that her high hemoglobin level during pregnancy was the cause of her son's health and protected him from diarrheal and other illnesses as an infant. Scientific evidence does not support her claims, however, the interpretation of her experience likely affects the content of the care she provides.

Providers expressed a wide range of beliefs about what ANC can accomplish and the most important components of ANC. These responses reflect their beliefs about consequences of ANC and likely affect their intention and behavior (17). The majority of responses were realistic, with a minority that reflected over-ambitious view on what ANC can accomplish, especially given the sporadic attendance and supply chain malfunctions that are characteristic of ANC in Haiti (44). Most providers think of ANC as a package of services, although some could separate services they viewed as essential from those they do not. If this package is not delivered in full, providers tend to perceive care as incomplete, or poor quality, leading to frustration.

Barriers to providers' perception of ideal care provision

Many providers stated that an important barrier to care provision was the low provider-patient ratio, which causes them to alter the care that they would like to provide. This was one of the topics providers

spoke most passionately about and referred to this as a cause of increased tension, stress and frustration. Triangulation of data between interview and observation data partially support their claims. The duration of consultations meets the minimum criteria according to Haitian standards for first and follow-up visits (36) but is over 50% less than FANC recommendations for both first and follow-up visits (45). The duration of consultations decreases throughout the day, consistent with providers' statements of consulting too many women per day. However, this decrease is roughly seven seconds per consultation, so it is unclear if this difference could be clinically meaningful unless there is an extremely large volume of women per day, which does occur at some clinics. Providers also reduce the percent of services of the physical exam and education and counseling performed on women throughout the day by less than 0.2% per woman (33). Again, this decrease is likely only clinically meaningful when there is a large volume of women seen per day. One possible explanation for this reduction, as providers say, is the need to reduce consultation durations to consult the high volume of women seeking care. Alternative explanations could include providers' perception of too many women per day, even if not necessarily fact (14), the large variation in how many attend ANC per day or provider fatigue.

A second important barrier to implementing the care that providers desire is the lack of materials and resources. In addition to causing frustration, providers also related this problem to fear of making mistakes in patient treatment if they do not have correct diagnostic or treatment materials and viewed these problems as leading to poor-quality care. This finding is well supported by other studies suggesting that, in addition to frustration, this often leads to embarrassment and, often, demotivation of health workers (30, 46). This also places providers in difficult situations such as how to ration scarce resources to patients, if providers should distribute expired medications and how to diagnose and treat patients in the absence of correct lab equipment (30, 46-48).

Providers not only spoke about barriers to care they would like to provide, but also cited barriers they perceive that women face in accessing the care they need, some of which providers felt they could or should be able to assist women with. Similar to ANC providers in Zimbabwe, Haitian providers showed they can be resourceful and altruistic, sometimes utilizing their own financial or social capital to help patients access care or supplies they need (30).

Decision making in context and coping strategies

Beliefs and views about ANC can drive provider behavior, but when there are environmental and resource constraints, how do providers transform their beliefs and organizational policies into actions and what is the effect of this on providers? The response to these questions varies by provider and by setting, but all are somehow forced to adapt the care they provide by developing coping strategies. These coping strategies can be based on the interplay between personal beliefs and experiences, the setting and the clientele. In a sense, these strategies become public policy (49). This phenomenon was descried in 1980 by Lipsky, as "street level bureaucracy" and has been shown to be relevant in numerous health care settings in developing countries (22-25, 49). Frontline workers, in this case ANC providers, become street-level bureaucrats who make impromptu decisions and, ultimately, ration care. These actions have the ability to alter intended consequences of ANC policy.

The most significant example of individual coping strategies in our study was how providers handle the high volume of women seen in clinics. As previously discussed, providers develop different ways of handling this situation, each of which could result in inconsistent care given to women across providers and possibly even by provider, depending on the day. For example, some providers spoke about not performing certain services to women in earlier stages of pregnancy and prioritizing women later in pregnancy so that they can perform more services with them. However, these actions contradict their

beliefs about being able to detect and treat problems or complications early in pregnancy, yet they were forced by circumstance to do so.

A second example of street-level bureaucracy is selection of services to emphasize while providing care. Providers stated that providing education and taking blood pressure are two of the most essential components of ANC and both are included in Haitian ANC guidelines for each ANC visit. The objective of taking blood pressure during ANC is to diagnose hypertensive disorders and the risk of pre-eclampsia. If either is suspected, referral should be made to a second or third level care facility (36). Our observation data showed that blood pressure is taken in 91% of consultations. However, only 5% of women were correctly referred. The exit survey revealed that 55% of women reported participating in an educational session the day observed. Even though deemed important by providers, these services could be neglected or appropriate action not taken due to constraints of time per consultation, limited number of staff, lack of a functioning blood pressure cuff, or the perception that referrals might be hampered by lack of patient resources.

The effect of mismatches between individual- and environmental-level influences on provider behavior was often expressed as causing stress, frustration, fear of mistakes and lack of satisfaction. It is not clear how the development of coping strategies alters these feelings. One study reported a positive aspect of adaptive coping strategies is the pride providers take in their ability to manage difficult situations (46). It is unclear if this sufficient to overcome the frustration of misalignment between individual beliefs and environmental factors, however.

Clinical guidelines for ANC can only be as effective as the environment in which they are implemented allows. The mismatch between provider beliefs and available resources, along with lack of clear guidelines and infrequent supervision, results in tremendous autonomy and decision-making responsibilities on the part of the ANC providers who participated in this study. This incongruity could

be the cause of inconsistent and often incomplete ANC, explaining why adverse maternal and neonatal outcomes that could be reduced by ANC remain high in Haiti, even with extremely high levels of ANC coverage (32).

Implications for implementation and future research

Environmental barriers play an important role in determining provider behavior and strategies to reduce these barriers are needed. These could include strengthening of supply chains, updating, developing and dissemination of up-to-date guidelines, and training and deployment of more health care workers. This would require political commitment, financing and management of policy makers at national and regional levels to effectively improve the performance of health care workers.

Reductions in environmental barriers to care provision are important but are not a panacea for improving health worker behavior, as provider beliefs about ANC are also likely important determinants of performance. Appropriate training oriented to the prevailing beliefs and coping strategies of providers, effective quality assurance mechanisms and ongoing support are needed to promote greater adherence to clinical guidelines. Interventions shown to improve adherence to guidelines in low-income country contexts include education and training, managerial approaches such as improved supervision and audit and feedback, and job aids (9, 50). Some of these interventions could alter beliefs directly, while others could help ensure consistent behavior, even without changes in beliefs, if well implemented.

Finally, we observed that providers had an easier time talking about their organization and the tangible, physical work environment than expressing their thoughts and beliefs about their work. This observation likely explains why previous ANC studies of provider behavior only identified organizational factors and did not touch upon the individual-level theoretical domains, underlying the importance of specific investigation of these factors. Without their investigation, conclusions and potentially

subsequent intervention design will likely focus on organizational factors, which may not be sufficient to lead to behavior change.

Validity of the data

This study's findings are limited by its relatively small sample size. Even with 18 interviews, this study was able to reach saturation in a number of themes and build support for its validity by triangulating responses for interview questions and comparing responses from interviews with observation and survey data. We believe that this study lays strong groundwork for future research about how ANC providers make care-rationing decisions based on their beliefs and the real-world barriers they face in providing care. It is possible, that providers' beliefs are based on their experiences, especially those with many years of experience, and as an internal coping mechanism providers alter their beliefs to match the environment. We did not investigate the potential for this.

We did not elucidate the pathways between individual, environmental and social factors that influence decision making, as this was outside the scope of our study. As highlighted in the vast literature about health care worker motivation in developing countries, it is likely these processes and pathways vary by provider and setting, and are unobservable (13, 16). To design more consistent health programs, we believe that an understanding of these causal pathways merits further investigation.

Finally, there was the potential for a response bias of providers, as the interviewers were known to the World Vision staff as "external consultants". These interviews took place after the observational portion of the study and one provider expressed concern that she was not randomly selected for the interview, but was selected based on her performance during the observations. This same provider was also concerned that her responses might be reported back to her supervisors. These issues were part of the informed consent process, but even with many assurances, it is possible at least some providers did not answer some questions completely or honestly. However, given our ability to triangulate data between

the three components of the study, we believe that our data are robust and show credible consistencies between methods.

Conclusion

ANC providers in Haiti work in an environment where structural barriers prevent them from performing the care that they would like, resulting in fear of making mistakes, stress and demotivation. The interaction between provider beliefs and the barriers they face make forces these providers to act as street-level bureaucrats, making unsupervised and impromptu decisions about ANC. This can lead to inconsistent and incomplete care, undermining important achievements in increased care coverage. The implications of these findings are that reductions in barriers to care are important, but given the variation in beliefs about ANC and coping strategies, we conclude that training oriented to provider beliefs and coping strategies is needed to promote greater adherence to clinical guidelines and, ultimately, improve care quality.

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APPENDICES

Appendix 4.1 - Interview Guide, English Version

Name and type of facility/Mobile clinic provider where was observed_____

Date of interview _____/_____

Provider sex - Male/Female

[Following informed consent] Now we can get started. I'd like to have a conversation with you about your experiences and opinions as a provider of antenatal care at this health center/with World Vision. I will ask you some questions, but there are no right or wrong answers. Please feel free to tell us what you think. At the end of our conversation I will ask you some questions about yourself and about this facility/mobile clinic(s) in which you work. Are you ready to begin?

1. In your opinion, in what ways can antenatal care help a pregnant woman?
2. Which components of antenatal care are the most important for pregnant women?
3. Which components of antenatal care are the least important for pregnant women?
4. What services or information should **all** women receive during pregnancy when they visit a health care provider?
    a. Are there certain women who should receive more care during pregnancy?
    b. Are there certain women who should receive less care during pregnancy?
5. What are the qualities of/how would you define "high-quality" antenatal care?
6. If a woman receives "high-quality" antenatal care, how will that affect her?
7. If a woman receives "high-quality" antenatal care, how will that affect her baby?
8. How would you define "low-quality" antenatal care?
9. If a woman receives "low-quality" antenatal care, how will that affect her?
10. If a woman receives "low-quality" antenatal care, how will that affect her baby?

Now I will ask you more specifically about your work

11. How would you describe the quality of ANC that you are able to provide to pregnant women at this clinic?
    a. Can you provide an example of when you were able to provide high-quality care?
        i. Probe causes and consequences
    b. Can you provide an example of when you were not able to provide high-quality care?
        i. Probe causes and consequences
12. We have observed many antenatal care providers in the Central Plateau, and not everyone provides the same type of care nor do they provide it in the same way. What do you think influences the way that you personally provide care to pregnant women?
    a. What are some of the factors about this program/institution that allow you to provide the quality of care you believe is of high-quality?
    b. What are some of the factors about this program/institution that prevent you from providing the quality of care you believe is of high-quality?

c. What are some of the factors about you personally that allow you to provide the quality of care you would like?
d. What are some of the factors about you personally that prevent you to providing the quality of care you would like?
e. Are there any other factors that cause you to provide the care that you do at this health center?

13. If you had the power to change certain aspects of your work in this health center/with World Vision that would allow you to provide better quality antenatal care, what would you change?
14. In your opinion, what antenatal care do the majority of pregnant women want to receive during a antenatal visit?

Thanks for answering these questions. We are almost done, but I would like to ask you a few questions about the structure of the health center that you work for/World Vision.

15. Do you have a supervisor(s) who oversees your work?
    a. What kind of activities does this person/people perform when they supervise you?
        i. How often do you interact with your supervisor(s)?
    b. What, if any feedback does this person/people provide?
        i. How is this feedback given to you?
            1. Probe form of feedback, manner of feedback
        ii. How often is this provided to you?
        iii. Do you find supervision, as it is currently carried out, useful to you?
        iv. Do you think that the supervision (or lack thereof) influence the care that you provide to women?
16. Are you aware of any guidelines/regulations in this institution/WV about the content of antenatal care?
    a. What are some examples of these guidelines
    b. Are you able to share these guidelines with us?
    c. What kind of training did you receive about these guidelines/regulations, when you started working in this institution/with World Vision?
    d. What factors about this health center/program do you feel enable you from following the guidelines?
    e. What factors about this health center/program do you feel inhibit you from following the guidelines?
    f. If you have provided antenatal care somewhere else, are these the same guidelines/recommendations?
    g. How many times do these guidelines recommend that a pregnant woman seek care during pregnancy?
    h. Based on your experience, do you believe that that number of visits can have positive outcomes for a woman?

Appendix 4.2 – Antenatal Care Provider Interview Oral Consent Form, 2012

As you know, I am working on a research study sponsored by World Vision and Cornell University about antenatal care in Haiti. In addition to the antenatal care observations that are now complete, I would like to ask you to a few questions about your experience providing antenatal care in this clinic. If you are willing to listen, I will describe this portion of the study to you, answer any of your questions and you can let me know if you agree to participate.

As you probably remember, I am part of a research team that is assessing the antenatal care provided to women in different parts of Haiti to understand what works well and where improvements can be made. In addition to observations of antenatal care, we are interviewing antenatal care providers at many different health clinics.

If you agree to participate in this interview, it will last approximately 30-45 minutes. During that time, I ask a few questions about the operations of the clinic and the care you provide to pregnant women. The information you provide will be used to help understanding the how and why ANC is provided the way it is in Haiti.

I do not anticipate any risks to you from participating in this study. Please be assured that whether or not you participate in this study, it will not affect the status of your employment at this health clinic, now or anytime in the future. We will not tell anyone if you decide to participate or decline the offer. Should you accept to participate, you may change your mind at any time during the observations without any negative consequences from me or your employer. Again, your participation is voluntary. Any information we write down or observe will not be shared with anyone at this clinic such as your supervisor or anyone within the organization that you work for nor any of the women who seek care at this clinic. All information will be held confidential. I will not ask your name and your name will not appear on the form nor any reports that are written about this research. I will closely guard the observation form once it is filled in to make sure no one else can read it.

If you agree to participate, I would like to take written notes and we speak and I would like to audio record this interview, so that I can refer to it later. Your name will not appear on the form or the audio tape, nor on any report that we write about this study. You may agree to be interviewed but decline to be audio taped. Once the interview is complete, I will guard the audio and any notes I write down closely at all times until this field visit is complete. Following this visit, these forms and audio will be locked in an office and/or entered onto a password protected computer to maintain confidentiality and only authorized researchers will have access to them.

There is no payment for taking part in the study.

Do you understand what I have explained to you? Do you have any questions that you would like to ask before making a decision about your participation?

In case you have any questions or concerns about this study later, you may direct them to Dr. Lesly Michaud in the World Vision office in Port-au-Prince. (Exact address is 9 Impasse Hardy, Juvenat, Route du Canape Vert, Telephone is 509 2257-0956)

Now that I have explained the purpose of the study and some of what it will mean for you to participate, would you like to participate in this study? Do you agree to be audio recorded during this interview?

Chapter 5 – Discussion and conclusion

Antenatal care (ANC) is an essential health service for women in many low-income countries. The evidence base for individual ANC interventions is stronger today than ever before and coverage of ANC has increased globally over the past 30 years. Yet ANC has not received the same interest and action as other global health initiatives and gains in positive outcomes lag behind coverage increases. This research identified factors that have prevented ANC from being more effective at the international, national and local levels and suggests multiple means to improve ANC.

The papers of this dissertation complement each other by focusing on different phases of ANC, from guideline development and dissemination to care delivery and immediate outcomes of care (Figure 1.1). The multi-level, mixed-methods nature of this research facilitated explanation of findings between chapters: Chapter 4 explains part of the "why" of Chapter 3 and these two chapters together are illustrative of many of the problems described in Chapter 2. This systems-oriented research, therefore, allowed us to make a variety of suggestions for how to improve ANC in Haiti and in similar countries.

Key lessons and suggestions of the dissertation

Important lessons from each portion of the research and related suggestions to improve ANC are summarized in Table 5.1. These findings are then compared and discussed across chapters.

Table 5.1 - Main lessons and suggestions of the three dissertation chapters

Chapter Title	Lessons	Suggestions
Antenatal Care: History, challenges and suggestions for the future	ANC has failed to gain political priority due to factors including: 1. lack of leadership at the international level 2. a strong focus and incentive structure surrounding the MDGs 3. the complexity of ANC and historical "confusion" of its potential 4. weak and negative framing	1. Generate leadership for ANC by groups within the WHO 2. Design future health goals that prevent short-sighted incentives for health programs 3. Research and promote ANC as an integrated health service/package(s) of services 4. Add to evidence base for ANC by calculating DALYs-averted
Comparison of quality of antenatal care between a traditional and alternative delivery model in Haiti	1. ANC as observed reflected less than half of the recommended services according to Haitian guidelines. Providers offered "their version" of routine care. 2. Providers performed a higher proportion of services for the physical exam and health provider communication and interpersonal components of care than for education and counseling and intake. 3. Although there are statistically significant differences in four of the eight care components (intake, lab exams, distribution of supplies, IFA and TT, and infection control), it is likely the magnitude of difference for infection control and distribution of supplies, IFA and TT only are clinically important. 4. About 50% of women knew the results of their lab exams, limiting the effectiveness of performing exams without essential follow-up. 5. Women's perception of ANC quality was high.	1. Given the similar performance of health workers and outcomes for many of the eight care components studied, comparable interventions could likely be used to improve quality of care in both delivery models. 2. Findings from this study and comparable ones in low-income countries are strikingly similar; the research focus should shift from assessment of ANC to trials of interventions that can improve provider performance. Assessment of quality may still be useful as formative research or as process indicators for monitoring and evaluation or quality improvement initiatives. 3. Based on previous research, likely potential interventions to improve quality of care include managerial approaches (supervision, audit and feedback), job aids and decision tools, educational interventions for providers.
Antenatal care provider behavior in Haiti: beliefs, barriers and coping strategies	1. Environmental-level barriers to high-quality provider performance included weak supply chains and low provider-patient ratio. 2. Provider beliefs about outcome expectations of care and perceptions of quality of care drove performance and coping strategies. 3. Similar to conclusions from Chapter 3, these individually developed coping strategies led to "provider-specific" care, inconsistent with guidelines.	1. Interventions at the environmental-level will likely improve provider performance, but are not a panacea on their own. 2. Interventions to improve provider performance include training oriented to prevailing beliefs and coping strategies. These need to be integrated into the interventions proposed above. 3. Effective quality-assurance mechanisms can be a longer-term strategy to improve provider performance.

1. ANC is not a priority health service for international and national-level policy makers (Chapter 2). The Haitian example is illustrative of this (Chapters 3 and 4).

In Chapter 2, we identified lack of leadership, the complexity of ANC, the trend towards vertical programming and lack of framing as explanations for the absence of political priority for ANC at international and national levels. At national levels, ANC is often neglected by overworked policy makers who receive little incentive to invest in a complex health service. This gap in leadership and direction leaves frontline workers at hospitals, health clinics, mobile clinics, as well as community health workers, to figure out how to manage and adapt ANC recommendations and convert these into care.

Haiti provides a good example of these problems. Haitian national guidelines for ANC were last updated in 2011. Even then, these guidelines were not consistent with WHO recommendations in terms of the number of visits recommended, the content of these visits and the timing of services. Three years later there have been changes to the WHO recommendations for ANC, such as the addition of calcium supplementation for the prevention of pre-eclampsia and hypertensive disorders (1), that are not reflected in the Haitian guidelines. In Haiti, it is not uncommon to see information inconsistent with national guidelines posted in health centers, sometimes even with a seal from the Ministry of Health and the Pan-American Health Organization (2). Although Haiti has not adopted FANC, posters promoting the FANC model of care hang in some government health centers.

Also at the Haitian national and sub-national levels, the training health workers receive is inconsistent, with different schools using different curriculum. Providers who were interviewed stated that they were not often supervised and only 44% have received training on institution-specific ANC guidelines. Given these circumstances, it is no wonder this dissertation documented relatively poor care at both fixed and mobile clinics. And yet, Haiti has somehow managed to reach a high level of ANC coverage, an

unfulfilled achievement, as supportive and successful ANC delivery mechanisms are not in place to take advantage of this accomplishment and poor maternal and perinatal outcomes persist.

At the clinic level, this dissertation showed that ANC in Haiti was poorly delivered in both fixed and mobile clinics, with more similarities than differences between quality of care. In both clinic models, the interpersonal delivery of care was strong, with providers treating patients respectfully. However, their adherence to Haitian clinical guidelines ranged between 10 and 53% for clinical and educational services.

2. Lack of adherence to clinical guidelines is similar in both models of ANC and similar to papers from other countries (Chapter 3). Reasons for this can be partially explained by findings in Chapter 4.

As concluded in Chapter 3, lack of adherence to clinical guidelines is very similar between clinic models, with the exception of lab exams performed and infection control. In two areas of care, the physical exam and education and counseling, analysis showed that the highest random variability was by provider, not clinic, indicating that provider decision making likely influenced performance more than environmental determinants. These findings of select provider adherence to guidelines are also strikingly similar to studies of ANC quality in other sub-Saharan and Asian countries (3-6). A strength of this dissertation is the qualitative research (Chapter 4) provides more in-depth analysis of ANC provider behavior than what is currently in the literature. This chapter concluded that provider beliefs and environmental-level barriers interact, leading to individually-developed coping strategies by providers. Such individually-designed care results in select and inconsistent adherence to clinical guidelines. It also leads to discontent and frustration among ANC providers, although the effects of these were not studied.

Due to the mixed-methods nature of this research, we were able to compare findings between the various methods. Many of our conclusions are supported by these comparisons and help rule out

potential biases. For example, providers stated that they perceive interpersonal care as an important mediator of other aspects of care. Observation data support this claim and show that providers, in fact, do treat women as they say women deserve to be treated. Women also perceive being treated well, as they reported in the exit survey.

One area where triangulation of data revealed inconsistent findings was in education and counseling. Providers stated the importance of education, but little takes place between the provider and patient. Education does take place in groups, usually led by health staff (in fixed clinics) and community health workers (in mobile clinics). These were not observed as part of the study, but their effectiveness is questionable, as only about 55% of women could provide one correct response for topics in which they received education. Education and counseling was one of the weakest care components observed in this study.

3. Similar interventions are needed to improve ANC in both clinic models (Chapters 3 and 4)

The similarities in care provided and the determinants of care between fixed and mobile clinics suggest that interventions to improve quality can be comparable. This research can inform the design and implementation of these methods so they can be adopted by policy makers and ANC practitioners. Although this research did not specifically test interventions, recommendations are made based on research findings from Chapters 3 and 4 and a literature review about improving health worker performance in low and middle income counties (7-9). Increasing the likelihood of success for such interventions includes design based on specific barriers to performance and strategies built on factors that can directly influence these barriers (9, 10). Coupling of these interventions may add additional impact (7, 9).

Our recommendations of interventions are based on the success of these in previous study for ANC-and maternal-health related health services in similar settings. They include: in-service training combined

with improved supervision, job aids and task shifting, and quality assurance or a quality-improvement process (Table 5.2).

As previously mentioned, the percent of education and counseling performed was found to be especially poor in our study and could benefit from interventions specific to this problem. Education and counseling have been found to be weak in many countries where providers are overburdened and can't or don't take the time to counsel women, even if they believe it is an important component of care (11-13). Job aids and task shifting have been successfully used for this purpose maternal and newborn health, including ANC (14, 15) and family planning (16).

Table 5.2 – Research findings and proposed interventions to improve provider performance

Finding	Proposed intervention	Justification
Poor adherence to guidelines for intake and physical exam; Lack of training on guidelines; Varying perceptions of importance of ANC components and individualized coping strategies. Lack of supervision, partially leading to select adherence to guidelines	In-service training combined with improved supervision	Varying perceptions of importance of ANC components could be reduced with appropriate training, but training alone as an intervention has had mixed results. Training coupled with other approaches is more likely to be effective. Supervision consistently found to have moderate to large effects on provider performance in the short term
Poor adherence to guidelines and poor delivery of education and counseling, yet belief in their importance.	Job aids and task shifting	These have been found to be more successful when large changes in behavior is not required and health workers accept guidelines. Moderate success in ANC and maternal care in previous studies.
Lack of formal process to evaluate provider performance and quality of care	Quality assurance/quality-improvement process	These processes are means to incorporate the above interventions into a longer term, permanent strategy of provision of high-quality care.

4. Are mobile clinics a viable option for ANC delivery? (Chapter 3)

This study was not able to assess if the World Vision mobile clinics increased ANC coverage, although mobile clinics have been shown to do so in other countries (17, 18). However, given Haiti's high ANC coverage and women's care seeking at multiple sites, this context is likely different than those in previous studies and therefore conclusions about their effect on coverage can't be drawn.

Even so, based on the results from this study, mobile clinics do appear to be a viable option for ANC delivery. They are not a "magic bullet" and have similar implementation problems as traditional fixed clinics. This study clearly shows no evidence that mobile clinics provide worse or "second-class" service, a concern of policy makers in at least one other country in the region (19). Unfortunately, most ANC received by women at fixed and mobile clinics was equally and similarly poor, calling for parallel interventions to improve all ANC.

Specific to mobile clinics is the question of feasibility of lab exams. Even if not feasible given logistical and financial constraints, this is one area that highlights the importance of referral and counter-referral between mobile clinics and higher-level fixed facilities. Women who attend mobile clinics for their general care should be referred to clinics that offer lab exams and their results, if women agree, should be shared with the mobile clinic staff or written on maternal health cards so that proper follow-up and treatment can be performed. This would require a high level of communication and coordination between clinic types, something that currently needs improvement.

5. Are other community-based approaches, in addition to mobile clinics, a viable way to improve ANC coverage and quality? (Chapters 2 and 3)

As discussed in Chapters 2 and 3, a potential approach to reorganization of human resources for ANC is further division of care between health centers and communities. This could include the use of

community health workers to educate, screen or refer women to higher levels of care, and distribute supplements such as IFA and calcium. Another alternative, given the weak quality of education and counseling of ANC identified in this study, is women's groups, which have been shown to be successful at reducing neonatal mortality and increasing positive health behaviors by mothers in Nepal and India (20). These groups can be successful by developing locally acceptable strategies to problems identified by women themselves.

As this research showed, alternative models to traditional ANC, including mobile clinics and likely community-based solutions come with challenges, including management, administrative and communication. The less centralized nature of these interventions provide even more potential for lack of consistency and adherence to guidelines and therefore require management in their anticipation. The interventions described in Table 5.2 could help reduce some of these anticipated problems.

6. Can priority setting assist policy makers in improving ANC? (All chapters)

Although decisions about what health interventions, conditions or populations to prioritize are difficult, they inevitably occur, either implicitly or explicitly. For example, as reported in Chapters 3 and 4, Haitian ANC providers act as street-level bureaucrats, making impromptu and uncoordinated care-rationing decisions. A more formal process of priority setting could shift these difficult decisions from providers to practitioners at higher levels, making them more transparent and consistent.

Priority setting tools exist, although there is no consensus about which is ideal at national or regional levels (21, 22). Current tools use measures such as cost-effectiveness (the Disease Control Priorities Project or WHO-CHOICE tools) or context-specific intervention effectiveness in addition to cost-effectiveness (Lives Saved Tool) (21). However, these tools are not able to account for social or political realities and complexities that decision makers face and exclude values from the decision making process (23).

7. Are there any additional alternatives to thinking about how to improve the provision of maternal and perinatal health?

The potential for "business-as-usual", or no action, should not be an approach ANC, as it would result in continued and needless maternal and perinatal morbidity and mortality and waste of resources. Although the easiest option for any country and policy-maker, ANC providers and pregnant women would continue to bear the burden of this inaction. Eliminating ANC is also not a practical perspective, as ethically, there are too many proven benefits to providing such care.

8. No solution is a "silver bullet" given the complexity of ANC (All chapters)

A key lesson from the implementation of IMCI in the late 1990s and early 2000s was that health system limitations restricted the ability of IMCI to expand to national levels while maintaining high-quality care (24). These limitations included lack of organizational and strategic plans, and weak political commitment and human resources. There are many parallels between IMCI and ANC, and these lessons should not be minimized or repeated in the effort to improve ANC.

ANC is composed of multi-faceted activities and, as in Haiti, often take place in weak health systems. To be effective, several components of these systems must come together to have impact, including: human resources, information, medical products, vaccines and technologies, financing and leadership and governance (25) . Yet, managers and policy makers who manage ANC directly do not have control over these systems and tend to have little ability to implement recommendations that require broad actions reaching across the health system.

These challenges called for a paradigm shift for IMCI and the same can be said for ANC. By combining many of the recommendations outlined above, attempting multiple delivery mechanisms and integrated

approaches to care, incremental progress can be made towards improving care, even in the face of weak health systems and such complexity.

Returning to ANC's importance to nutrition

This dissertation focused on all aspects of ANC, not only its nutrition components. This is because nutrition interventions comprise a large proportion of recommended ANC interventions, roughly 30-40%, depending on the guidelines (26). Additionally, ANC is the platform for the delivery of nutrition interventions targeting pregnant women. Although there are examples of stand-alone nutrition programs, they are most commonly integrated into the general pregnancy care a woman receives when she presents at a health center and are delivered by a nurse or nurse midwife, not a nutritionist. If the ANC system is not functioning well, then by extension, the nutrition interventions that are part of ANC most likely can't function well either. Therefore the impact of nutrition programs depends on the quality of ANC.

The intertwined nature of ANC and nutrition interventions also indicates that the determinants of quality might be similar for ANC and nutrition interventions. Using the ANC rubric to analyze the anemia reduction program in both fixed and mobile clinics in central Haiti showed that IFA was distributed to 87% of women, however the counseling and education to support IFA consumption was poor (Table 5.3). The benefits of IFA were mentioned to only 23% of women, potential side effects mentioned to 3% and high-iron foods mentioned to 9%. Women's knowledge in these areas corresponds to educational messages delivered. Even with high distribution of IFA and women's satisfaction with receipt of IFA, rates of maternal anemia remain high in this part of Haiti. These findings, specific to IFA, are reflective of gaps in the wider ANC system. It is therefore plausible to conclude that nutrition interventions such as IFA fail in Haiti, in part, because ANC is weak.

Because nutrition interventions compose about a third of ANC interventions and rely on ANC as a delivery mechanism, and the causes of poor quality nutrition interventions are similar to those of poor quality ANC, it is reasonable to state that a practical way to improve nutrition interventions is to improve ANC. This could be accomplished by applying the approaches suggested above.

Table 5.3 - IFA-specific structural, process and outcome quality measures

Care Component	Structural Measures	Percent
Distribution of supplements, TT and supplies	Clinic has sufficient IFA for day's attendance	95%
	Clinic has sufficient multiple micronutrient (with iron) for day's attendance	87%
Care Component	**Process Measures**	**Percent**
Intake	Provider asks if patient feels symptoms of severe anemia, including fatigue, shortness of breath or headaches	6%
Lab exam	Blood test for anemia performed (Hb or Hct)	7%
Distribution of supplements, TT and supplies	Provider gives IFA, MM with iron or prescription for IFA	87%
Educational messages	Provider informs patient:	
	how to take IFA (frequency and dosage)	74%
	benefits of IFA	23%
	side effects of IFA	3%
	high iron foods	9%
Health provider communication and interpersonal delivery	Provider delivers educational messages:	
	in a way patient can understand	97%
	in a polite manner	97%
	Solicits questions	3%
Care Component	**Outcome Measures**	**Percent**
Distribution of supplements, TT and supplies	Satisfaction with amount of supplements provided	93%
Educational messages	Knowledge of quantity and frequency of consumption*	94%
	Knowledge of IFA side effects	6%
Health provider communication and interpersonal delivery	Satisfaction with ability to ask questions	95%
	Satisfaction with explanation of information	94%

How this dissertation sets up future research

The methods and findings from this dissertation helps advance ANC research in multiple ways. The rubric that was created for assessment of ANC quality can be applied in other contexts. This rubric was

created using a conceptual model of quality of care by Donabedian (27). This model separates quality of care into structural, process and outcome measures of care quality. We compiled information about ANC interventions and services from the WHO, JHEPEIGO and USAID to fill in the rubric and define the eight care components (Appendix 3.1). Adaption of the rubric was performed for use in Haiti, as the Haitian guidelines are loosely aligned with international recommendations. Adaption to country-specific recommendations might be required before use in other settings depending on the study's objective.

The findings from this dissertation also help set up future research to inform implementation science, or approaches to help ANC providers perform more closely to clinical guidelines and increase the quality of care. This is especially powerful given the multiple scales of study of this dissertation and the ability to integrate knowledge between them. Additionally, the mixed-methods used in this dissertation and the ability to compare and contrast findings between methods. Implementation science can be useful to all ANC interventions, not only the nutrition-specific interventions. This application of implementation science can lead to uptake of "best practices" or research findings from efficacy studies, closing the efficacy-effectiveness gap and improving outcomes.

Dissemination and use of findings

The findings from this research can be used by multiple stakeholders, including the MSPP, World Vision, other NGOs who provide ANC and ANC researchers. The two government agencies most implicated by these findings in the MSPP are the Office of Family Health and the Office of Nutrition, who have historically not collaborated together well.

The MSPP could take a number of approaches to improve ANC in Haiti. The question is where to start. The Office of Family Health could use these findings to update their ANC guidelines and disseminate these, training health workers on these updates and incorporating them into the education of future health workers. Yet guideline dissemination and training are rarely enough to have a long-term impact

on health care quality, suggesting the need for the interventions discussed in Table 5.2 and possible alternative delivery mechanisms. The Office of Nutrition currently lacks incentive to work with the Office of Family Health given their history of "turf wars", yet just like nutrition relies on ANC as a delivery platform, the success of the Office of Nutrition depends on the success of the Office of Family Health.

World Vision might be disappointed with some of these findings compared to their expectations, but there are encouraging signs about the World Vision program that should be highlighted. World Vision clinics performed comparably to MSPP clinics, with the exception of lab exams and infection control. This is an accomplishment given their resources and the high volume of program participants. Their staff should be commended for their positive treatment of patients in the face of difficult conditions. Sadly, this is unique in maternal health. Although their program no longer exists at large scale in the Central Plateau, World Vision's work continues in Haiti with other funding sources and these results could be used more broadly to inform program design and implementation, including the necessary commitment and resources to quality assurance and supervision.

In the Central Plateau, much of ANC is delivered by the MSPP with the assistance of NGOs. Often these NGOs create their own internal clinical guidelines and policies. Many of these NGOs have invested in building their human resources more than the MSPP, creating a competitive advantage to collaborate with the MSPP with a focus on human resource interventions.

We hope that other ANC researchers will realize the importance of a system perspective and progress beyond ANC condition- and disease-specific implementation research. Our findings, when considered with similar studies, should also be a wake-up call for some of the proposals outlined in Chapter 2, including a call for leadership and collaboration.

Conclusion

This dissertation highlights many of the challenges of ANC, from global guideline development and dissemination to national and local implementation and the immediate outcomes of knowledge, satisfaction and referrals. By analyzing ANC at multiple levels, we identified where historical and current break downs occur and make suggestions to improve immediate and final outcomes. This dissertation highlights the need for the application of translational and implementation sciences to "close the gap" between these efficacious interventions and effectiveness at scale, ultimately leading to improved maternal and perinatal health and nutrition.

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